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December 1992

1991 Report on USDA Human Nutrition Research and Education Activities

A Report to Congress

FEB 27, 1993



PREFACE

This report was prepared under the auspices of U.S. Department of Agriculture's (USDA's) Subcommittee for Human Nutrition, Research and Education Committee of the Secretary of Agriculture's Policy and Coordination Council.

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ACRONYMS AND ABBREVIATIONS

The following list of acronyms and abbreviations is provided as a quick index of Federal departments, agencies, and activities and other organizations that are mentioned more than once in this report. Parenthetical acronyms and abbreviations identify the groups within agencies and departments.

AAP	American Academy for Pediatrics
ACF	Advisor for Children and Families (HHS)
ACOG	American College of Obstetrics and Gynecology
AID	Agency for International Development
AMS	Agricultural Marketing Service (USDA)
APHIS	Animal and Plant Health Inspection Service (USDA)
ARS	Agricultural Research Service (USDA)
ASCS	Agricultural Stabilization and Conservation Service (USDA)
ASFSA	American School Food Service Association
BLS	Bureau of Labor Statistics (DOL)
CB	Census Bureau
CDC	Centers for Disease Control (DHHS)
CES	Cooperative Extension Service
CSRS	Cooperative State Research Service (USDA)
DGWG	Dietary Guidance Working Group
DHHS	Department of Health and Human Services
DOD	Department of Defense
DOE	Department of Energy
DOL	Department of Labor
DOT	Department of Transportation
DVA	Department of Veterans Affairs
ESCOPE	Experimental Station Committee on Planning
EPA	Environmental Protection Agency
ERS	Economic Research Service (USDA)
ES	Extension Service (USDA)
FAS	Foreign Agricultural Service (USDA)
FDA	Food and Drug Administration (DHHS)
FGIS	Federal Grain Inspection Service (USDA)
FNS	Food and Nutrition Service (USDA)
FSIS	Food Safety and Inspection Service (USDA)
HCFA	Health Care Financing Administration (DHHS)
HNIS	Human Nutrition Information Service (USDA)
HRSA	Health Resources and Services Administration (DHHS)
ICNM	Interagency Committee on Nutrition Monitoring
IHS	Indian Health Service (DHHS)
ILSI	International Life Sciences Institute (FASEB)
MCHB	Maternal and Child Health Bureau (HHS)
NAL	National Agricultural Library
NAS	National Academy of Sciences
NASA	National Aeronautics and Space Administration
NASS	National Agricultural Statistics Service (USDA)
NAWICD	National Association of WIC Directors
NCHS	National Center for Health Statistics (DHHS/CDC)
NIAAA	National Institute on Alcohol Abuse and Alcoholism
NIH	National Institutes of Health (DHHS)

ACRONYMS AND ABBREVIATIONS (Cont.)

NFSMI	National Food Service Management Institute
NMFS	National Marine Fisheries Service (DOC)
OBPA	Office of Budget and Program Analysis (USDA)
OCA	Office of the Consumer Advisor (USDA)
OGC	Office of General Counsel (USDA)
OPA	Office of Public Affairs (USDA)
PHS	Public Health Service (DHHS)
USDA	United States Department of Agriculture

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EXECUTIVE SUMMARY

Introduction

In accordance with the provisions of section 1452(b) of the National Agricultural Research, Extension, and Teaching Policy Act Amendments of 1985 (7 U.S.C. 3173 note), this report on the human nutrition research and education activities of the U.S. Department of Agriculture for fiscal year (FY) 1991 is hereby submitted. This is the fifth annual report in which emphasis is placed on directions and highlights with no effort made to restate the Department's detailed plan outlined in the report submitted in 1986.

Contents of Report

New human nutrition research projects initiated, research highlights, and other research findings during FY 1991 for USDA agencies are presented by research areas as follows:

- o Normal Requirements for Nutrients
- o Role of Nutrition in Health Promotion and Prevention of Diet-Related Disorders
- o Food Composition and Nutrient Bioavailability
- o Food and Nutrition Monitoring Research
- o Food and Nutrition Information and Education Research
- o Food Marketing and Demand
- o Research on Government Policies and Socioeconomic Factors

The numbers of USDA research projects included in the Human Nutrition Research Information Management System in December 1991 are shown by Federal nutrition code category. The food and nutrition information and education programs within USDA also are summarized by new initiatives and ongoing programs to meet their clients' needs. During FY 1991, a nutrition education initiative was developed. A Nutrition Education Initiative Working Group made up of administrators of eight USDA agencies led in the development of a proposal for new activities.

Human nutrition research and education activities in USDA continued to be linked with the nutritive value of foods, human nutritional needs, the kinds and amounts of foods that Americans consume relative to their needs, and strategies for improving diets and the food supply. The major role of USDA is to help individual consumers understand the relationship of food and its nutrients to the maintenance of health and the prevention of diet-related disorders during the different stages of life. Since consumers' demands drive the marketplace, the importance of sound, research-based nutrition education programs for consumers, as well as for food producers and processors, is obvious.

Funding Levels

The actual or estimated expenditures for human nutrition research and human nutrition information and education by several USDA agencies for fiscal years 1986 through 1991 are given (tables 2-6). The total amount of human nutrition research support by USDA has increased from \$60.7 million in FY 1986 to \$82.3 million in FY 1992, an increase of 36 percent. During the same period, USDA support for human nutrition information and education has increased from \$132.1 million to \$196.6, an increase of 49 percent. Most of the funds for information and education activities were distributed to State health and nutrition agencies. The total USDA support for human nutrition in FY 1991 was \$250.4 million and is estimated to be \$278.9 million in FY 1992.

Coordination

Continued progress was made during FY 1991 in achieving coordination within USDA, with other Departments, and with the private sector and international organizations, thus helping to provide the best services possible within available resources. A description of coordinating mechanisms in place during FY 1991 and the specific recommendations made by outside advisory groups are also included in the report.

Benefits

The potential benefits of improved diets and nutritional status are better health and a longer, more active, and more satisfying life. The development of new information to fill knowledge gaps, as well as the application of existing knowledge, is essential to the prevention of diet-related health problems and to increased performance and satisfaction.

1991 ANNUAL REPORT ON USDA HUMAN NUTRITION RESEARCH AND EDUCATION ACTIVITIES

A REPORT TO CONGRESS

I. INTRODUCTION

A. Charge

In accordance with the provisions of section 1452(a) of the National Agricultural Research, Extension, and Teaching Policy Act Amendments of 1985 (7 U.S.C. 3173 note), a U.S. Department of Agriculture (USDA) comprehensive plan for implementing a national food and human nutrition research and education program was submitted to Congress in December 1986. Section 1452(b) of this act requires the Secretary annually thereafter to submit a report on the human nutrition research activities conducted by USDA. Such reports, prepared under the auspices of USDA's Subcommittee for Human Nutrition, under the Research and Education Committee of the Secretary's Policy and Coordination Council, have been submitted for FY 1987, 1988, 1989, and 1990. This report covers the Department's activities in human nutrition research and education for FY 1991. As before, emphasis is given to new directions and accomplishments during the year. The 1986 report gives the detailed program plan components.

B. Legislative

1. Nutrition Education and Training Program (NET)

The Nutrition Education and Training Program (NET), established in 1977, was reauthorized for 5 years, FY 1990 through 1994, by the Child Nutrition Act as amended by Public Law 101-147, November 10, 1989. By giving grants to State agencies, NET aims to build good food habits by teaching the fundamentals of nutrition to children, parents, educators, and school food service personnel. NET reaches children by coordinating learning experiences in the classroom, the school cafeteria, and the community. Teachers and school food service employees receive appropriate instruction in nutrition, nutrition education, and food service management. Parent involvement in NET activities is an important aspect of the program.

During FY 1991, 55 State or territorial agencies participated in NET.

2. Nutrition Education Needs of Children Participating in the National School Lunch Program, Summer Food Service Program, Child and Adult Care Food Program (Child Care Component)

In response to Public Law 101-147, a report was prepared that reviewed the nutrition needs of children participating in Child Nutrition Programs. It also included a review of the nutrition education needs of teachers and school food service personnel, two other groups targeted under the NET legislation.

3. Nutrition Guidance for Child Nutrition Programs

Public Law 101-147 mandated that the Departments of Agriculture and Health and Human Services jointly develop and distribute a publication entitled "Nutrition Guidance for Child Nutrition Programs." It is intended that school food authorities and other organizations and institutions participating in

Child Nutrition Programs apply the nutrition guidance described in the publication when preparing meals and supplements served under the programs. This publication will be disseminated to all program cooperators in the spring of 1992.

4. The Food Stamp Program

Public Law 101-624, the 1990 Farm Bill, provides for nutrition education of individuals eligible for food stamps and improvements in nutrition education:

- a) Section 1739 authorizes the Secretary to assign responsibility for the nutrition education of people eligible for food stamps to the Cooperative Extension Service, in cooperation with FNS. The stated goal of this provision is to "encourage the purchase, preparation, and consumption of nutritious foods."
- b) Section 1761 authorizes the Secretary to make 2-year competitive grants (totalling up to \$2 million annually) to enhance interagency cooperation in nutrition education activities and to develop cost-effective ways to inform people eligible for the Food Stamp Program about nutrition, resource management, and community nutrition education programs. The Secretary is required to make awards to one or more State cooperative extension services which are then required to coordinate with other State or local agencies that serve low-income people. The projects include evaluations, implementation plans for replication in other States, and reports to Congress and other interested entities.

5. Nutrition Monitoring

Public Law 101-445, the National Nutrition Monitoring and Related Research Act of 1990 passed by Congress and signed into law by the President, has considerable effect on the programs of the Human Nutrition Information Service (HNIS). HNIS is the USDA lead agency for nutrition monitoring and development and implementation of the Dietary Guidelines for Americans. The act requires the Secretaries of the U.S. Department of Agriculture (USDA) and the Department of Health and Human Services (DHHS) to establish and implement a comprehensive plan for the coordinated National Nutrition Monitoring and Related Research Program with numerous components; to establish an Interagency Board for Nutrition Monitoring and Related Research; to establish a nine-member National Nutrition Monitoring Advisory Council; to report to Congress biennially on the progress of the coordinated program including annual reports from the Council; to jointly publish Dietary Guidelines for Americans every 5 years; and to review and approve all Federal dietary guidance prior to publication, with provision for a public comment period on such guidance if disapproved by either Secretary. HNIS is working jointly with the Department of Health and Human Services to implement the statutory requirements of the National Nutrition Monitoring and Related Research Act of 1990.

6. Nutrition Labeling

Public Law 101-535, the Nutrition Labeling and Education Act (NLEA), was passed by Congress and signed into law by the President in 1990. This Law amends the Federal Food, Drug, and Cosmetic Act, not the Federal Meat Inspection Act or the Poultry Products Inspection Act. Therefore, only FDA is required by law to enforce it. USDA is affected indirectly by the NLEA through harmonization efforts.

- o Nutrition Labeling Regulations

The Department of Agriculture's Food Safety and Inspection Service (FSIS) published an Advance Notice of Proposed Rulemaking (ANPR) on April 2, 1991, on the nutrition labeling of meat and poultry products. The intent of the ANPR was to solicit comments, information, data, and recommendations from consumers, industry, public health officials, and other interested parties to assist the agency in developing proposed regulations for nutrition labeling of meat and poultry products. The ANPR was a result of several nutrition endeavors. These endeavors included the National Academy of Sciences report that recommended FSIS as well as the Food and Drug Administration (FDA) mandate nutrition labeling for all packaged foods under their respective jurisdictions (except for certain exemptions), and the Nutrition Labeling and Education Act of 1990 (NLEA) which required mandatory nutrition labeling for most FDA-regulated packaged food products. Although the NLEA is only for foods regulated by FDA, FSIS, in line with labeling harmonization efforts, suggested considering various options for a parallel nutrition labeling system for meat and poultry products.

In response to the comments received on the ANPR, the agency moved forward in developing proposed regulations. FSIS's proposed nutrition labeling regulations, published November 27, 1991, would amend the Federal meat and poultry products inspection regulations by permitting voluntary nutrition labeling on single-ingredient raw meat and poultry, and establishing mandatory nutrition labeling for other meat and poultry products, with the exception of products used for further processing. The agency's proposed regulations parallel FDA's, with few exceptions.

The agency is analyzing the comments on the proposed regulations, and will be publishing final regulations in November 1992.

C. Changes in Resources or Infrastructure

1. Special Supplemental Food Program for Women, Infants, and Children (WIC)

a. Cost Containment

Funds generated through cost-containment efforts implemented by WIC State agencies continue to be substantial and are having a significant effect on the program. The most popular cost-containment initiative has been infant formula rebate systems. Currently, 74 of 86 State agencies operate an infant formula rebate system pursuant to Public Law 100-237. Actual savings from infant formula rebates for FY 1990 were \$509 million. For FY 1991, preliminary reports indicate that close to \$600 million will be saved. These savings, plus steadily increased appropriations, have permitted a substantial increase in the number of WIC participants. From FY 1985 to FY 1991, WIC has experienced a 57-percent increase in appropriations. In FY 1990, WIC provided benefits to 4.5 million participants. As of June 1991, the number of participants had reached an all-time high of 5.0 million, with a projected September 1991 participation level of 5.2 million.

b. Drug Abuse Information

The legislative mandate requiring WIC to provide drug abuse information and referrals for counseling and treatment authorized an amount, not to exceed

\$10 million of the program appropriation, to be used for this purpose in FY 1989, and amounts as appropriated for subsequent fiscal years. Program funds used for such activity were \$1.1 million for FY 1989 and 1990, with \$88,000 obligated for 1991 and \$48,000 obligated so far for 1992. A final rule formalizing WIC's drug education legislative mandates should be published in FY 1992.

c. Farmers' Market Coupon Demonstration Projects

The Hunger Prevention Act of 1988 (Public Law 100-435) authorized WIC to carry out Farmers' Market Coupon Demonstration Projects for a 3-year period. Under these projects, WIC clients were given coupons to redeem at participating farmers' markets for fresh fruits and vegetables. Congress appropriated \$2 million for each fiscal year, 1989 and 1990, and \$2.75 million for FY 1991. The projects expired in March 1992. A legislatively mandated evaluation of the projects has been completed. Results indicate that the projects are generally satisfactory in the areas of accountability, delivery of benefits, and overall project management. The evaluation also indicates that:

- o the projects had a positive overall impact on WIC participants and farmers;
- o consumption of fruits and vegetables was higher among WIC participants who received the farmers' market coupons;
- o patronage of the farmers' market by WIC participants appeared to continue, at least for a short while, after the farmers' market coupons were spent;
- o participating farmers reported a 12-percent average increase in sales as a result of the program; and
- o in spite of the relatively small effect on the income of farmers, participating farmers are generally very supportive of the project.

A report on these results was submitted to Congress in April 1991. Pending legislation proposes to extend these expiring pilot projects and give them program status.

d. Changes in Agricultural Marketing Service

o Transportation and marketing merge

A Transportation and Marketing Division (TMD) was established on January 1, 1991, when AMS merged its Wholesale Market Development and Federal-State Marketing Improvement Programs with the Office of Transportation, which has been a separate agency. This merger permits more efficient coordination of the Department's marketing and transportation policies. One mission of TMD is to provide an efficient transportation system--highways, railroads, airports, waterways--to move agricultural commodities from the farm gate into domestic and international marketplaces. Another mission focuses on ways to improve the handling, processing, packaging, storage, and distribution of agricultural products in wholesale food distribution centers and farmers' markets. Matching funds are also provided to State agencies for studies aimed at improving their marketing services.

II. HUMAN NUTRITION RESEARCH ACTIVITIES

A. General

Human nutrition research and education in USDA has traditionally been linked with the nutritive value of foods, human nutritional needs, the kinds and amounts of foods that Americans consume relative to their needs, and strategies for improving diets and the food supply. A major effort of USDA is to understand the relationship of food and its nutrients to health promotion in individuals at all stages of life.

The application of new nutritional knowledge often leads to changes in kinds and amounts of foods people consume, and thus the demand for food. Similarly, any improvement of the nutritional quality of the foods we eat must involve corresponding changes in the agricultural food system. Hence, the nutrition of individuals or population groups depends on all the factors that occur in the "food chain" before food becomes available for consumption, i.e., during production, processing and storage, and marketing. In recent years new types of foods have been introduced. To ensure an adequate supply of high-quality foods, an intimate knowledge of food composition, of the biological effects of food constituents, and of nutritional requirements and tolerances of humans is needed. This knowledge can be derived only through interdisciplinary efforts, connecting nutrition research with pre- and post-harvest agricultural science and technology. The value of the knowledge is achieved by educating the public and encouraging people to adopt the most healthful food habits.

The human nutrition research activities during FY 1991 are presented under six areas as detailed in the national plan. These are:

- o Normal Requirements for Nutrients
- o Role of Nutrition in Health Promotion and Prevention of Diet-Related Disorders
- o Food Composition and Nutrient Bioavailability
- o Food and Nutrition Monitoring Research
- o Food and Nutrition Information and Education Research
- o Research on Government Policies and Socioeconomic Factors

USDA does not conduct research on the role of nutrients in the treatment of chronic diseases or disorders. It does, however, support some research on health promotion or prevention of nutrition-related disorders, especially as related to fats, fiber, and complex carbohydrates and other components of foods and diets. The USDA program focuses especially on normal nutrient requirements and content and bioavailability of nutrients in foods.

In December 1991, a computer search was made of ongoing research in USDA relating to human nutrition, using the Human Nutrition Research Information Management System (HNRIMS). Table 1 shows the number of USDA research projects in most of the nutrition code categories under each of the six

research areas listed. The table also shows the percentage of the total number of USDA projects that were coded for each of the categories. In addition, the percentage of the total number of research projects in HNRIMS for all Federal agencies which are USDA-supported projects is given by nutrition code category. The USDA projects include those conducted by the USDA agencies, the State agricultural experiment stations, and the 1862 and 1890 land-grant institutions and Tuskegee University. Some of these projects receive no Federal funds. The total Federal funds expended by USDA for human nutrition research in FY 1991 was \$12.2 million.

The Agricultural Research Service (ARS) is the principal intramural research agency of the Department. Its research in human nutrition is conducted largely at five separate Human Nutrition Research Centers and at Regional Research Centers. The Centers maintain close communication with each other, and the research programs are coordinated through the National Program Staff. Each Center has a different research thrust and provides its unique contribution in solving high-priority national problems. The locations and primary missions of the ARS Human Nutrition Research Centers are listed:

Beltsville Human Nutrition Research Center, Building 308, BARC-East, USDA-ARS, Beltsville, MD 20705; Dr. Walter Mertz, Director, 301/344-2157. Its history can be traced back to 1894 at Wesleyan University at Middletown, CT. A move was made to Washington, DC, in 1906 and to Beltsville, MD, in 1941. Research is conducted on nutrient composition and nutritional qualities of food. Studies are performed on energy metabolism and nutritional requirements. Dietary strategies are developed, which can delay the onset of nutrition-related chronic diseases.

Grand Forks Human Nutrition Research Center, P.O. Box 7166, University Station, USDA-ARS, Grand Forks, ND 58202; Dr. Forrest Nielsen, Director, 701/795-8456. It was established in 1970. The focus is on defining human requirements for trace elements and the physiological and biochemical factors which influence those requirements.

Western Human Nutrition Research Center, P.O. Box 29997, USDA-ARS, Presidio of San Francisco, CA 94129; Dr. James Iacono, Director, 415/556-9697. It was established in 1980. Improved methods are developed for monitoring and evaluating nutritional status, and factors that lead to malnutrition are investigated. Studies on human nutritional requirements are conducted.

Human Nutrition Research Center on Aging at Tufts University, USDA-ARS, 711 Washington Street, Boston, MA 02111; Dr. Irwin Rosenberg, Director, 617/556-3330. It was established in 1979. Research is conducted on the special nutritional needs of persons as they age with a view toward enhancing the quality of later life through improved nutrition and health.

Children's Nutrition Research Center, 1100 Bates Street, USDA-ARS, Houston, TX 77030; Dr. Buford Nichols, Director, 713/798-7000. It was established in 1979 in connection with Baylor University. The focus is on determining the unique nutrient needs of pregnant and lactating women and of children from conception through early years of development.

Table 1. USDA Research in Human Nutrition
(from HNRIMS, September 25, 1991)

<u>HNRIMS Nutrition Code Area</u>	<u>USDA Projects*</u>	<u>USDA Projects as % of Federal Research in Area</u>
	<u>Number</u>	<u>%</u>
<u>Normal Human Requirements for Nutrients</u>		
1. Maternal	50	5.3
2. Infant and Child	64	6.8
3. Adolescent	18	1.9
4. Adult	84	9.0
5. Elderly	33	3.5
10. Immunology, Nutrition, & Infection	21	2.2
12. Genetics and Nutrition	28	3.0
13. Nutrition and Function	116	12.4
14. Nutrient Interactions	125	13.4
15. Other Conditions & Nutrition	42	4.5
<u>Role of Nutrition in Health Promotion and Prevention of Diet-Related Disorders</u>		
6. Cardiovascular Disease and Nutrition	69	7.4
7. Cancer	33	3.5
8. Other Diseases (Osteoporosis, Diabetes)	22	2.4
9. Trauma & Nutrition	4	0.4
11. Obesity, Anorexia, and Appetite Control	55	5.9
17. Carbohydrates	104	11.1
18. Lipids	207	22.1
19. Alcohols	7	0.7
20. Proteins and Amino Acids	168	17.9
21. Vitamins	117	12.5
22. Minerals and Trace Elements	189	20.2
23. Water and Electrolytes	16	1.7
24. Fiber	58	6.2
25. Other Nutrients in Foods	83	8.9
<u>Food Composition and Bioavailability of Nutrients</u>		
26. Food Composition	244	26.1
27. Bioavailability of Nutrients	133	14.2
28. Effects of Technology on Nutritional Characteristics of Food	252	26.9
29. Other Food Science Research	111	11.9
<u>Food and Nutrition Monitoring Research</u>		
16. Nutritional Status	140	15.0
30. Food Consumption Surveys	52	5.6
31. Dietary Practices, Food Consumption Patterns	135	14.4
<u>Food and Nutrition Information and Education Research</u>		
32. Methods for Informing Public About Nutrition	31	3.3
33. Other Nutrition Education Research	26	2.8
<u>Effects of Government Policy and Socioeconomic Factors</u>		
34. Effects of Government Policy and Socioeconomic Factors on Food Consumption and Nutrition	64	6.8
		86

*Numbers are not additive as projects may be assigned more than one nutrition code (936 USDA research projects in system).

The USDA Cooperative State Research Service (CSRS) is the agency in the U.S. Government that serves as an interface and coordinating mechanism between the U.S. Government research organizations, the 59 designated States and territorial agricultural experiment stations, and the 1890 colleges and Tuskegee University. Funds are appropriated by Congress and administered by the Secretary of Agriculture through the Cooperative State Research Service to each of the stations on a formula basis. Before the States can spend the money, projects are peer-reviewed and then submitted to CSRS for approval. The States have a large degree of freedom in allocating the money but they must submit projects for approval and annual progress reports. National research priorities are recommended by the State experiment station directors to the Department of Agriculture and then incorporated into the Department's annual request for funds from Congress.

Five regional research projects typify areas of nutrition research currently underway at State agricultural experiment stations in cooperation with ARS and HNIS. These are:

- Nutrient Bioavailability, which involves the cooperative efforts of 10 States and ARS;
- Health Maintenance Aspects of Dietary Recommendations Designed To Modify Lipid Metabolism, which involves 10 States and ARS, and deals with the nutrition aspects of individuals' health and well-being;
- Behavioral and Health Factors That Influence the Food Consumption of Young Adults (8 States and HNIS);
- Nutritional Assessment in Older Adults: Diet Intake and Biochemical Studies (9 States, HNIS, and ARS); and
- Dietary Fat and Fiber: Knowledge, Perceived Risk, and Dietary Practices (12 States and HNIS).

The latter three regional projects deal with problems and opportunities to bring about the use of better nutritional practices in the general population.

CSRS also administers special and competitive research grants programs. In FY 1991, special projects covering human nutrition were conducted at Cornell University on "Integration of Nutrition Goals and Food Systems"; at Iowa State University on "Designing Foods to Improve Nutrition"; and at Louisiana State University on "Dietary Fat, Food Intake, Energy Expenditure and Body Composition."

In FY 1991, the National Research Initiative Competitive Grants Program (NRICGP) subsumed the previously funded USDA Competitive Research Grants program. The Nutrition, Food Quality and Health division of the NRICGP included two programs. A research emphasis on human nutrition was continued in the Human Nutrient Requirements for Optimal Health Program. In addition, a

new Food Safety Program was initiated. The primary objective of this program is to increase understanding of the mechanisms of pathogenesis, prevention and control of food-borne disease-causing bacteria, especially those growing at refrigeration temperatures.

B. Normal Requirements for Nutrients (ARS, CSRS)

1. National Research Initiative Competitive Grants Program (NRICGP)

The Human Nutrient Requirements for Optimal Health Program within the Nutrition, Food Quality and Health division of the NRICGP, CSRS, awarded \$2,592,000 in grant support for 22 projects in FY 1991. New information obtained from these research projects will increase our understanding of human nutrient requirements and factors influencing them. The following projects were funded in FY 1991:

- o Effect of Omega-3 Fatty Acids on Vitamin E Requirements: A Rat Immune Cell Model, \$135,094--3 years.
- o Desirable Fluoride Intakes by Infants, \$110,535--2 years.
- o Vitamin B-6 Metabolism in Pigs with Portal, Hepatic and Jugular Vein Catheters, \$125,558--3 years.
- o Binding of Cobalamins to Transport Proteins: A Biophysics Study, \$152,304--3 years.
- o Biotin in Human Milk, \$113,427--2 years.
- o Metabolism of Serum Retinol Binding Protein In Vivo and In Vitro, \$123,941--3 years.
- o Dietary Fat Regulation of Pancreatic Lipase Gene Expression, \$100,445--2 years.
- o Molecular Genetic Analyses of Dietary Fat-Regulated Gene Expression, \$238,872--3 years.
- o Pregnancy and Vitamin B-6 Bioavailability, \$36,242--1 year.
- o Dietary Fat and Low Density Lipoprotein Oxidation, \$100,000--2 years.
- o Animal Models for Human Carotenoid Metabolism, \$103,607--2 years.
- o The Vitamin D Intake Requirement in Healthy Postmenopausal Women, \$150,000--3 years.

- o Effect of Zinc Deficiency on Rat Neutrophil Chemotaxis, \$66,732--2 years.
- o Thyroid Hormone Metabolism in Iron Deficiency Anemia, \$101,943--2 years.
- o Role of Dietary Lipid in Immune Function, \$100,000--2 years.
- o Metabolism and Function of Retinoic Acid in Quail Embryogenesis, \$114,000--2 years.
- o Role of Zinc and Copper in the Nervous System, \$150,000--2 years.
- o Stable-Isotopic Investigation of Folate Bioavailability and Nutritional Status, \$100,000--2 years.
- o Nutritional Copper Status and the Nervous System, \$114,000--2 years.
- o Human Carnitine Status: Renal Adaptation to Carnitine and Macronutrient Intake, \$100,000--2 years.
- o Intracellular Copper-Trafficking Proteins, \$105,300--2 years.
- o Macronutrients and Regulation of Neuropeptide Gene Expression, \$150,000--2 years.

Results from ongoing intramural and other extramural research supported by USDA are given in the following sections.

2. Infants and Children

- o Measuring Growth and Energy Expenditure in Premature Infants

I. Infants who are born prematurely must be frequently monitored to determine whether they are growing at an appropriate rate. Total body fat (TFM, or total fat mass) is known to be an indicator of the rate of infant growth and development. ARS researchers at the Children's Nutrition Research Center in Houston, TX, have now devised and validated an inexpensive method for measuring TFM in preterm babies. Their tests showed that an accurate estimation of total body fat can be made by measuring the subscapular skinfold thickness just beneath the infants' shoulder blades. Skinfold thickness measurements from biceps, thighs, and triceps were also shown to predict TFM, but in decreasing order of correlation relative to the subscapular measurement.

II. Because indirect calorimetry appears to be the most accurate means available to measure energy expenditure in infants, researchers at Houston have been attempting to improve the accuracy, precision, comfort, and safety

of the device. They have developed two models--one especially for preterm and the other for term infants. Both calorimeters have been found to perform well in instrument testing, as well as in actual studies with infant subjects. The technology used in the construction of these models should help establish a standard for infant calorimetry.

III. Determining the amount of energy that premature infants use is important to maintaining their health. However, since indirect calorimetry interferes with the infants' normal activities and requires constant monitoring, the Houston scientists have evaluated an alternative energy expenditure measurement called the "doubly labeled water method" in which oxygen and hydrogen are labeled. While this is a more desirable measurement technique because it does not interfere with the infants' activities, the accuracy of results derived from its use with premature infants is still somewhat in question. A comparison of energy expenditure data obtained by each method with the same test group showed that results were similar for the infants as a group. However, the results obtained by indirect calorimetry proved more accurate for individual subjects than were those derived through the doubly labeled water method. In part, this was true because the high percentage of body water in preterm infants and the high rate of water flux to CO_2 production make the latter method sensitive to analytical error.

These improved techniques for monitoring energy use and body fat in infants depend upon the application of new methods and ideas and will lead to the development of better diets for ensuring infant health.

- o Undernourished Children Benefit From Vitamin A and Zinc Supplements

After learning that young schoolchildren in northeast Thailand were suffering from lack of adequate zinc and vitamin A, scientists associated with the ARS Vitamin and Mineral Nutrition Laboratory in Beltsville, MD, undertook a study to determine whether daily supplementation with those two nutrients would be beneficial. The 6-month study involved 140 children who consumed a basically poor diet consisting of rice, a few vegetables, and chili peppers. Divided into various test groups, the children received either capsules of vitamin A, zinc, a combination of both, or a placebo. The results showed that dietary supplementation could indeed increase blood levels of both target nutrients and improve certain important functions, including night vision. Additionally, the study yielded convincing evidence that lack of adequate dietary zinc impairs the ability of vitamin A to fully carry out its function in the body. These findings alerted Thai authorities to a potential public health problem that can be quite easily averted by the supplementation with less than twice the daily RDA of vitamin A and zinc.

3. Maternal Nutrition

- o Selenium Loss and Replacement in Lactating Women

Lactating women must consume sufficient amounts of nutrients such as selenium to meet both their own needs and those of their infants. Recently, scientists in the ARS Vitamin & Mineral Nutrition Laboratory in Beltsville, MD, undertook an evaluation of the utilization (absorption, retention, and appearance in milk and blood) of two chemical forms of selenium--selenite and selenomethionine. Stable isotope tracers were used to track the movement of these supplements in lactating, nonlactating, and never-pregnant women subjects. Significantly more selenium from selenomethionine than from selenite was absorbed, retained, and appeared in the plasma of all three groups. It was also concluded that the dietary recommendation for selenium in lactating women should be based on the current recommendation for women, but include an added allowance for losses in breast milk.

- o Developing Indicators of Benefit for Dietary Supplementation of Pregnant and Lactating Women

Women are anovulatory during lactation, and the duration of this anovulatory period is affected by nutritional status. However, it is difficult to investigate the separate contributions of each of these factors in free-living human subjects. Researchers have developed an animal model of postpartum anovulation using the chronically malnourished laboratory rat. This research has not only established the suitability of the rat as a model for studying this phenomenon, but it also has clearly identified that maternal nutritional status acts synergistically with lactation to lengthen the duration of postpartum anestrus. Inasmuch as food supplementation programs are often targeted to undernourished women, it is essential that all of the intended and unintended consequences of such programs be fully understood. This animal model provides a tool for doing so.

- o Factors Influencing the Nutrition Health of Adolescents During and After Pregnancy

Inadequate food intake associated with low weight gain and access to medical care are major causes of low birthweight infants in the United States. Dietary quality of adolescents participating in this project improved during pregnancy and had decreased at 1 year following pregnancy. Pregnant adolescents increased their consumption of milk and dairy products, and their diets were higher in calcium, riboflavin, vitamin A, and ascorbic acid than those with post-pregnancy diets. Intakes of iron, zinc, vitamin B6, and folate were less than the recommended allowances during and after pregnancy. At 1 year, preferences for whole milk and skim milk were less and higher for salted nuts and unsalted chips. Cravings for sweets and salt were significantly associated with sugar and sodium intakes in pregnancy. Craved foods included chocolate, fruits and fruit juices, dairy products, fast foods, pickles, spicy foods and salty snacks. Overall, parents, peers, and television did not significantly influence food-related purchases or dietary quality. Snacks eaten while viewing television were similar in composition to other foods eaten, except for fat which was significantly lower in snacks.

4. Adult Nutrition

o What Are the Dietary Energy Needs of Adults?

I. Accurate recommendations on dietary energy (calorie) requirements form the basis for determining the amounts of food aid given to poor families, and also for assessing whether the food supply of different communities is adequate. Current Recommended Dietary Allowances (RDA) on energy needs are based on theoretical calculations because it was not previously possible to measure actual energy needs directly in individuals leading normal lives. Now, scientists at the ARS Human Nutrition Center on Aging at Tufts University in Boston, MA, have successfully used the doubly-labeled water technique to make direct measurement of the energy requirements of young and old men. Findings indicate that energy recommendations have substantially underestimated usual energy needs and suggest that current RDA's may significantly underestimate usual energy requirements for physical activity. These new data contribute to a growing realization of the need to reevaluate energy intake recommendations and analysis of food consumption data.

II. Methods developed at the turn of this century were used to calculate the calorie values (metabolizable energy-ME) still published in nutrient data references such as the widely respected Agriculture Handbook No. 8 (Composition of Foods; Raw, Processed, Prepared). Because of growing emphasis on increasing consumers' consumption of fiber and decreasing their fat intake, it is important that the method for calculating ME be as accurate as possible. Scientists in the ARS Energy and Protein Nutrition Laboratory in Beltsville, MD, recently set out to revalidate the calorie calculation method by conducting a human feeding study that employed two natural diets of differing fiber and fat contents. The conclusion was that the measured ME of the two diets was overestimated by U.S. food tables, and underestimated by British tables. This suggests that a revision of the calorie calculation methods in current use may be necessary to provide a basis for more accurate dietary guidance.

o Searching for an Indicator of Vitamin B6 Status

In order to best facilitate optimal vitamin B6 nourishment, it is important that a means be found to ascertain an individual's vitamin B6 status. Researchers at the ARS Human Nutrition Center on Aging at Tufts University in Boston, MA, recently evaluated the use of homocysteine analysis as an indicator of B6 deficiency. Homocysteine is a toxic amino acid that forms naturally in cells as a result of the metabolization of methionine, an essential amino acid. Therefore, cells use two mechanisms to reduce potentially toxic homocysteine concentrations: export it out of the cell into the bloodstream, or convert it to other substances. In the latter case, vitamin B12, folic acid, vitamin B6, and other vitamins are required. Since the measure of homocysteine in the blood was known to be a good indicator of vitamin B12 and folic acid status, researchers sought to learn if a similar correlation might be made with B6. Surprisingly, it did not prove to be true,

so the nutrition community still awaits the development of an alternative vitamin B6 assessment method.

- o Dietary Fish Oil and Brussels Sprouts Deter Experimental Ulcerative Colitis

The effects of diets containing 6.3 percent Menhaden oil (FO) and/or 25 percent freeze-dried Brussels sprouts (BS) on drug-metabolizing enzyme system (DMES) activities were assessed in the degraded carrageenan-induced colitis guinea pig model. Animals fed dietary FO had significantly increased ability to metabolize drugs as reflected by an increase in liver cytochrome P-450 and in proximal small intestine benzo(a)pyrene hydroxylase activity. Consumption of Brussels sprouts significantly increased microsomal glutathione S-transferase and benzo(a)pyrene hydroxylase activities in the proximal small intestine. Based on preliminary histopathological assessment of the tissues obtained at necropsy, dietary FO plus BS appear to have a protective effect against cecal inflammation. This may result from a combined or synergistic effect of the dietary combination on both induction of DMES catalyzed eicosanoid metabolism and eicosanoid biosynthesis. These preliminary data suggest that the combination of FO and BS offers protection in this model of experimental cecal inflammation.

- o Sex Differences Are Found in Zinc Intake and Absorption

Dietary requirements for important nutrients such as zinc must be based on the level of their actual consumption and absorption in human subjects. Therefore, two research diets were developed at the ARS Grand Forks Human Nutrition Research Center composed of 200 foods in the average amounts commonly consumed by American men and women age 25 to 30. For 9 weeks, 14 women consumed daily diets containing 7.8 milligrams of zinc, while 14 men consumed diets containing 14.0 milligrams of it. Researchers found that women absorbed a larger proportion of zinc from their diet than did the men, but got less total zinc and excreted the absorbed zinc faster than the men. In another test with five diets, one of which was nutritionally adequate in zinc and four of which were not, absorption was higher with lower zinc levels. The differences in zinc absorption were related to body size and adaptation to concentration in the diet to regulate the total amount absorbed.

- o Accurate Means Are Sought To Detect Copper Depletion

I. While extreme copper deficiency may manifest itself through physiological changes such as abnormal heartbeat, glucose tolerance, or blood pressure changes, accurate means for assessing lesser degrees of copper inadequacy have not yet been found. Therefore, scientists at the Grand Forks Human Nutrition Research Center recently conducted a human study that yielded a number of new findings about copper status. For example, loss of copper via sweat was found to be much lower than previously reported. Copper balance was found to adjust to a change in dietary copper intake within 2 weeks of the change. Different subjects responded to reduced dietary copper in different ways, with nearly

half producing less of a copper-containing enzyme and experiencing increased cholesterol level and platelet size, whereas the remainder of the subjects did not. This suggests that individual differences may be a significant factor in copper metabolism.

II. Because of the individual difference in human copper metabolism, scientists at the ARS Western Human Nutrition Research Center in San Francisco, CA, have developed a computer simulation model of copper metabolism in adult men. In tests, this compartmental model representing plasma, liver, and other body tissues has simulated whole body copper metabolism over a 90-day period and accounted for both oral and intravenous copper administration routes. Model-predicted masses within each tissue were found to closely agree with known copper concentrations. Such findings suggest that (1) copper metabolism depends, at least in part, on the route of administration, and (2) body stores of copper are tightly regulated. This model is of interest to scientists studying copper metabolism because it allows predictions to be made based on past studies. The level of copper needed to produce a desired effect can be predicted, as can timing of fluid and tissue sampling for maximum effect. It should be a useful aid to understanding both normal and abnormal copper metabolism.

o Age and Sex Found To Affect Copper Status

While copper is known to be essential for human health, uncertainty persists with respect to the Recommended Dietary Allowance for copper. At present, none exists, despite the widespread belief that inadequate copper intake may be a factor in the development of heart disease. Because the incidence of heart disease differs between men and women, and varies with age, ARS scientists at the Grand Forks Human Nutrition Research Center recently studied copper metabolism in men and women age 20 to 83. They found that women age 20-59 absorbed more copper than men of the same age did, but that absorption became the same from age 60 to 83. While the rate of copper loss from the body was faster in women age 20-59 than in men, it was the same for both genders after the age of 60. There were also differences in biochemical indicators of copper metabolism in the blood of men than in that of women, and the differences seemed to depend upon age. Thus, it would appear that dietary copper requirements differ with age and gender, and that women may have a lower requirement for total copper intake than do men.

o Importance of Trace Elements and Energy Intake in Sports

The first scientific evidence has been generated to prove a functional relationship between performance and trace element status in people who are not severely nutritionally impaired. While nutritional status has been considered to be an important predictor of physiologic function and performance, scientific evidence of the link has only existed for severe energy and iron restriction. The roles of other important micronutrients required for energy utilization--particularly copper, magnesium, and zinc--had not been tested until scientists at the Grand Forks Human Nutrition Research

Center undertook tests with collegiate swimmers. These subjects showed that the best individual predictors of swim time were energy and trace element intakes. Decreases in swim times were associated with small, but apparently important, decreases in body copper stores and iron transport. Such information may be useful for nutritionists counseling individuals with vigorous lifestyles.

- o Health Effects of Arsenic in Drinking Water

As is widely said, it is the dose that makes the poison. That certainly seems to be true in considering the so-called trace elements--those minerals that have been found to be essential, in minuscule amounts, to optimal health and growth in humans. However, too much of such minerals as copper, selenium, or nickel can cause serious health problems. The same is true of the element arsenic, which is thought to cause alterations in pigmentation, hyperkeratosis, peripheral neuropathy, vascular effects, and dermal and internal cancer after long-term exposure. While most human exposure to arsenic comes from food, it is not thought to present a major risk because most is organic and readily excreted. Nevertheless, ARS researchers at the Grand Forks Human Nutrition Research Center have published a comprehensive review that discusses the uptake, metabolism, possible essentiality, and carcinogenicity of arsenic. They conclude that current methodology for risk assessment of arsenic may be inadequate because there is insufficient information available on the behavior of arsenic within the human system.

5. Elderly

- o Cholesterol Levels in Older Americans

Blood lipid values were determined on three separate occasions over a 3-month period in healthy 60- to 79-year-old subjects. Total cholesterol values as well as high density lipoprotein (HDL) cholesterol were significantly higher in females (n=24) than in males (n=23). The average total cholesterol was 224 + 41 mg/dl in females and 200 + 40 in males. It was found that the blood lipid values in many individuals showed large variations (7 percent for total cholesterol and 12 percent for HDL cholesterol) from one observation period to the next; for instance, the total cholesterol value in one individual differed by 25 percent during the study even though no change in diet or exercise occurred. In some individuals, however, the values were essentially identical at each sampling period. It was concluded that because individual variation in values may be large, a single determination of blood cholesterol should not be used for classification into "normal" or "abnormal" levels. Two or more determinations over a period of several weeks or months should be used to determine the mean blood lipid values.

- o Longitudinal Nutrient Intakes and Bone Density

Epidemiological studies estimate 20 million Americans have osteoporosis, which is felt to be responsible for approximately 1.3 million bone fractures each

year. It is estimated that 40 percent of all women will have a spinal fracture by age 80. Bone densities and nutrient intakes of vegetarian and nonvegetarian Caucasian women were measured in a longitudinal study over a 15-year period. The women ranged in age from 33 to 78 years when the study began.

Over the 15-year period, the women exhibited losses in height and bone density but maintained body weight. In general, the mean intakes of nutrients from food met or exceeded the RDA except for calcium and zinc. Analysis of the data indicates that increased intakes of calories and calcium are associated with increased bone densities. The manner in which nutrients interact to maintain bone density in vegetarians and nonvegetarians may differ. Further statistical analysis will be required to ascertain these differences.

- o Effects of Moderate Exercise on Dietary Intake, Iron Status and Cardiovascular Fitness in 56- to 67-Year-Old Women

The purpose of this study was to determine the effects of moderate exercise on dietary intake, iron status, and cardiovascular fitness in 56- to 67-year-old women. Seventeen women were assigned to two treatment groups: cycled (n=8) or non-exercise (n=9). Women in the exercise group cycled on an ergometer 3 days/week, 30 minutes/session at 70-75 percent maximal heart rate for 10 consecutive weeks. At weeks 0 and 11, submaximal treadmill stress tests were obtained to determine cardiovascular fitness level. Venous blood samples were also obtained at weeks 0 and 11 to determine serum ferritin, transferrin saturation, serum iron, total iron-binding capacity, hematocrit and hemoglobin concentrations. The data indicated a statistically significant increase in time required to reach 70 percent maximum heart rate, a significant increase in average heart rate/grade, and a significant increase in hemoglobin concentrations in the exercise group at week 11. No significant differences were found in other hematological parameters between the two groups.

Three-day dietary and activity records were obtained from each subject at weeks 0 and 10. Caloric intakes varied widely between the two groups, ranging from 1,223 kcal to 1,553 kcal at weeks 0 and 10 in the exercise group; 1,270 kcal to 1,348 kcal in the non-exercise group. The exercise group had significantly lower vitamin C and monounsaturated fatty acid intake than the non-exercise group at week 0. Intakes of zinc were less than 70 percent of the 1989 RDA in both groups, ranging from 57 percent to 67 percent. The results suggest that moderate exercise does not compromise iron status while enhancing the cardiovascular fitness level in 56- to 67-year-old women.

- o Assessing the Suitability of Rheumatology Clinic Populations for Research

Scientists at the ARS Human Nutrition Research Center on Aging at Tufts University in Boston, MA, recently undertook a census of all rheumatology clinic charts for patients who were being treated in that academic rheumatology clinic. Because the outpatient clinic is now the major source of subjects for the teaching and research activities of the university's academic

rheumatology program, it was important to determine the extent to which this specialized subject group might represent the prevalence of rheumatic diseases in the general population. Since analysis of the census data showed that the prevalence of diagnoses in the clinic did indeed mirror the incidence of rheumatic diseases in the general population, researchers will now proceed with plans for a large study of the nutritional, body composition, and cytokine status of patients with rheumatoid arthritis.

- o Influence of Age on Women's Dietary Calcium Use

It is well known that the amount of calcium absorbed from a given dose varies inversely with the level of calcium already in the diet. However, little is known about the effect of aging on the extent and timing of the change in absorption that occurs after a change is made in dietary calcium. Therefore, scientists at the ARS Human Nutrition Research Center on Aging at Tufts University recently conducted a study of age as a factor in calcium retention and hormone response to altered calcium intake. Twenty women were measured periodically for several months for calcium retention and for calcium-regulating hormone while consuming high- and low-calcium diets. Adaptation to altered calcium intake levels was found to occur within just a week of the dietary change. Although age-related differences were observed in both calcium retention and hormone levels, the timing and extent of diet-induced changes in these parameters did not vary significantly with age. This information will be helpful in designing future studies of calcium bioavailability that are necessary for improved understanding of dietary calcium utilization by the elderly.

- o Change in Bone Mineral Density in Healthy Postmenopausal Women

It is generally recognized that bone loss from women's spines is accelerated during the first few years after menopause, but then stabilizes at about 1 percent per year thereafter. However, the effect of menopause on the rates of bone loss from the hip and extremities has been less certain. Therefore, ARS scientists at the Human Nutrition Center for Aging at Tufts University recently examined the patterns of bone loss from several skeletal sites in 288 healthy postmenopausal women age 41 to 71. During this 2-year calcium supplement trial, it was found that just after menopause women experienced accelerated rates of bone loss from the spine and heel, but not from the hip or forearm. At the latter sites, the rate of loss remained fairly constant throughout the age range studied. Such knowledge about the rate and timing of bone loss is important to the formation of preventive strategies.

- o Leg Power and Performance in the Very Old

Believing that leg extensor power--more than simple leg power--is critical to such basic activities as walking or rising from a seated position, researchers at the ARS Human Nutrition Research Center on Aging at Tufts University have developed a special rig to allow the safe and convenient measurement of the power available in a single extension of one leg. It can be used with all age

groups and levels of physical capability, since the time required to make the measurement is very brief. Rather than depending upon circulatory or respiratory factors, it depends upon the resources which can be commanded by the nervous system from within the muscle cells. Power output measured in this way should correlate well with short-term performance measures such as the speed of stair climbing or chair rising. Thus, the measurement of leg extensor power by use of the rig may be used to predict performance in the very old, providing a very sensible tool to assess existing functional status, improvement during rehabilitation, and nutritional status and response to dietary changes.

6. Nutrient Functions

o Exercise and the Effects of High-Fat Feeding in Rats

The overall objective was to study the combined effects of treadmill exercise and dietary fat on adiposity and tissue lipids in rats. Two levels of exercise intensity and two levels of dietary fat were evaluated. Average daily caloric intake was similar among all animals regardless of exercise treatment or level of dietary fat. Exercised animals, particularly those on the high-intensity regimen, had less carcass and depot fat, and lower serum triglyceride levels than sedentary rats; however, intramuscular, liver, heart, and kidney fat were similar among groups. Diet as a single factor did not affect carcass fat or lipid contents in any tissue. Responses to each level of exercise intensity were similar when comparing high-fat and low-fat fed animals. High-fat feeding, however, increased liver cholesterol and reduced serum cholesterol. This research suggests that high-fat feeding does not affect the reduction of carcass fat or depot fat induced by either low-intensity or high-intensity exercise.

o Mechanisms of the Transfer of Sterols and Glycerides Into Cells

The purposes of these *in vitro* studies were to determine the mechanisms of transfer of certain lipophilic compounds from plasma lipoproteins into human cells and to relate the transfer to subsequent metabolism of the compounds. It has been shown that the transport of the lipophilic vitamins, D and E, in blood is via the lipoproteins. Vitamin E is transported subsequently into normal cells via the low-density lipoprotein (LDL) receptor-mediated pathway. Vitamin D movement is from LDL or high-density lipoprotein to cell membranes via contiguous contact. The plant sterol Beta-sitosterol transfers both passively and via the LDL receptor pathway. Lipids synthesized *in vivo*, especially those made in the liver, are also transported in lipoproteins. The transfer of these endogenous lipids into cultured cells via the LDL receptor-mediated pathway directly affects both sterol and glyceride synthesis from acetate. The passive transfer of smaller amounts of these lipids in mutant receptor-deficient cells affects lipid synthesis to a lesser extent.

- o Regulation of Fatty Acid Synthesis

Accumulation of fat may result directly from dietary lipids or from de novo synthesis of fatty acids within the animal body. The rat was used as a model to investigate the effects of thyroid hormone and the levels of carbohydrate and fat in the diet on de novo fatty acid synthesis. Although both thyroid hormone and a high-carbohydrate, low-fat diet stimulate lipogenesis in the liver, their effects on other tissues are less clear. It was found that adipose tissues vary in their ability to respond to these interventions. Lipogenesis in fat depots within the peritoneal cavity is stimulated by the high-carbohydrate diet, whereas subcutaneous fat is unaffected. The effects of thyroid hormone in white adipose tissue are complicated, since thyroid hormone is also lipolytic at these sites. Brown adipose tissue lipogenesis is uniquely stimulated by hypothyroidism. However, this stimulation requires the presence of sympathetic innervation, and in its absence thyroid hormone is stimulatory, as in liver. At sites where fatty acids are probably destined for incorporation into phospholipids (e.g., brain, lung, skin), fatty acid synthesis does not respond to changes in thyroid hormone or diet. In brown adipose tissue and liver it was found that changes in lipogenesis are accompanied by parallel alterations in the levels of mRNAs encoding the lipogenic enzymes, including acetyl CoA carboxylase and fatty acid synthase. This research will not only provide information about how and where the synthesis of fatty acids is regulated, but also act as a useful model for investigating the tissue-specific regulation of gene expression.

- o Arsenic Affects Methionine Function

Although poisonous in large amounts, the element arsenic has been shown to be necessary in trace amounts for optimal health in animals. However, details of its physiological activity remain unknown. Previous studies have shown that arsenic may be needed for proper metabolizing of methionine, a sulfur-containing amino acid that is essential for growth. Furthermore, arsenic deprivation has been shown to alter the metabolism of several compounds that use methionine in their biosynthesis. Therefore, scientists at the ARS Grand Forks Human Nutrition Research Center have been studying liver polyamines, which are necessary for proper cell division and require methionine for their synthesis. Research indicates that through an effect on methionine metabolism, arsenic modifies the concentration of liver polyamines--a finding that may also have implications for human health.

- o Boron Linked to Brain and Other Essential Functions

Until recently, scientific evidence of boron's essentiality had been lacking. Now, scientists at the ARS Grand Forks Human Nutrition Research Center have demonstrated that low dietary boron causes a shift in brainwave frequency that is associated with increased drowsiness. Their work suggests that boron may facilitate generalized brain arousal and be selectively involved in sensory and perceptual functions located in the posterior regions of the brain. In another study at Grand Forks, scientists showed that boron may be needed for

calcium to perform some functions at the cell membrane level, including the formation of various blood cells. Blood total hemoglobin concentration, average red blood cell hemoglobin concentration, and total hemoglobin content in red blood cells all increased in human subjects receiving boron supplementation. Blood triglycerides and an active form of vitamin D also increased. These findings indicate that boron--found naturally in fruits, vegetables, and legumes--is a beneficial nutrient that may be essential for humans.

- o Mechanism of Zinc Transport

Essential to the health of all cells, zinc is first absorbed from food and then enters the blood stream. Next, it flows through the body, primarily attached to a protein called albumin. To be useful to body cells, the zinc must leave the blood by passing through the blood vessel walls that are formed from endothelial cells. Each of the various organs to which this zinc goes maintains a unique and constant zinc concentration, although a few tissues--like bone and blood--are known to change their zinc concentrations under some conditions. ARS researchers at the Grand Forks Human Nutrition Research Center have been trying to learn more about this transport of zinc. By growing epithelial cells from blood vessel walls in the laboratory and examining the influence of various zinc ligands (binding compounds) on zinc transport, they have confirmed that albumin is essential for zinc transport to occur at the normal rate. A diminution of albumin has been found to accelerate the transport rate, as does increasing the concentrations of other zinc ligands. The latter finding helps explain why previous research on zinc transport produced contradictory results: the influence of zinc ligands had not been controlled. Researchers have discovered that by varying the concentrations of zinc ligands within a physiological range they are able to regulate the distribution of zinc into specific cells and tissues. Their studies underscore the importance of controlling the relative concentrations of zinc and its ligands in zinc transport kinetic research.

- o Effects of Exercise and Vitamin E on Host Defense Responses

Interleukin-1 (IL-1), tumor necrosis factor (TNF), and interleukin-6 (IL-6) are proteins that induce host defense responses to trauma and disease. Scientists at the ARS Human Nutrition Research Center on Aging at Tufts University in Boston, MA, have been studying the production of these proteins and their plasma levels in subjects subjected to downhill running on a treadmill, and supplemented with vitamin E. The day after exercise, IL-1 production increased in cells from subjects taking a placebo, but did not increase in cells from subjects taking vitamin E capsules. TNF production also increased the day after exercise, although the response was not blocked by vitamin E. In contrast, IL-6 production was unchanged after exercise, but vitamin E reduced the secretion of IL-6 at all times. Thus, immune factors seem to be related to changes in muscle protein, and vitamin E can affect these immune factors. Certain aspects of the human response to exercise-induced acute phase response can be modified by vitamin E.

- o Dietary Calcium and Manganese Affect Menstrual Cycle Symptomatology

The menstrual cycle has long been associated with numerous changes in female physiology and behavior, including changes in dietary intakes. ARS researchers at the Grand Forks Human Nutrition Research Center in Grand Forks, ND, have attempted to determine whether the amounts of calcium and manganese in the diet might influence the occurrence and severity of symptoms typically associated with menstrual distress. Using 10 healthy young women with normal menstrual cycles and not taking oral contraceptives, scientists found that adding calcium to the diet resulted in reports of improved mood states, fewer undesirable behaviors, and better mental concentration during all three phases of the menstrual cycle. More calcium also resulted in reports of decreased water retention during the premenstrual phase and lessened pain during the menstrual phase. While adding manganese to the diet also resulted in improved mood states and tended to decrease pain reported during the premenstrual phase, it only worked when additional calcium was also fed. These findings suggest that moderate increases in dietary calcium and manganese may be helpful in the management of symptoms typically associated with menstrual distress.

C. Role of Nutrition in Health Promotion and Prevention of Diet-Related Disorders

1. Body Composition

- o Predictor of Weight Loss Success Has Been Found

Obesity and preoccupation with dieting to lose weight are common throughout the United States. However, even in controlled research environments, weight response to specific weight loss programs can vary widely among individuals. Thus, a simple test to predict an individual's ability to lose body fat would be beneficial in developing a comprehensive weight loss strategy. In a study of 10 overweight women at the Western Human Nutrition Research Center, ARS scientists looked for some correlation between several different metabolic measurements and the quantity of body fat loss during weight reduction. A strong association was seen to exist between fat loss and the level of plasma-free fatty acids following an aerobic exercise workout. The relationship was observed without the need to account for the weight loss treatment. With further testing, this metabolic measure of plasma-free fatty acid levels following exercise may prove to be a useful predictor of an individual's ability to lose body fat in response to a range of diet and exercise interventions.

- o Effects of Underfeeding on Energy Expenditure and Subsequent Nutrient Intakes

The mechanisms of body weight regulation are not well understood. Scientists at the ARS Human Nutrition Research Center on Aging at Tufts University

recently observed the effects of intentional underfeeding--by 800 kilocalories each day, for 20 days--upon normal-weight young men with high levels of energy expenditure and leading their normal lives. Changes in total and resting energy expenditure, body composition, and subsequent voluntary nutrient intakes were measured. Researchers found that energy expenditure did not fall significantly with reduced energy intake, which indicates that energy expenditure does not play a major role in the regulation of energy balance during short-term decreases in energy intake. They also found the subjects' voluntary energy intake following the dietary restriction increased initially above the basic amount required for body-weight maintenance, was proportional to the weight loss during underfeeding, and rapidly restored the weight lost during underfeeding. Results indicate that (1) appetite--rather than adaptive variations in energy expenditure--plays the dominant role in day-to-day regulation of body weight, (2) energy balance is regulated primarily by adaptive variations in energy (food) intake, and (3) the hypothesis that energy-wasting mechanisms contribute substantially to body energy regulation is not confirmed.

- o Seasonal Changes in Women's Body Composition

The composition of specific body regions is of growing interest because of its association with health and diseases. For example, risk of falling is inversely related to lean tissue in the legs, and abdominal fat is positively associated with diabetes and cardiovascular disease. Therefore, scientists at the ARS Human Nutrition Research Center on Aging at Tufts University performed a longitudinal study to determine the rates of change in fat, lean, and bone tissue by season of the year, and overall, in healthy late postmenopausal women. In this year-long study of 125 women, researchers found that lean and bone tissue increased in the summer and decreased in winter in the arms, legs, trunk, and whole body. Fat, however, displayed the opposite pattern, decreasing in summer and increasing in winter. Although the women's body weights were stable throughout the study, they experienced a significant net loss of lean tissue from the legs and a net gain in fat tissue in the trunk--changes which might result from inadequate levels of physical activity.

- o Alternative Calorie Measurement Method Validated

To measure the amount of energy (number of calories) people actually use as they live their normal lives, a method using two natural but rare forms of water (doubly-labeled water) was developed for use in animals in the 1950's. During the last 10 years, the method has been adapted for use in humans. To assure the accuracy of such adaptations, scientists in the ARS Energy and Protein Nutrition Laboratory in Beltsville, MD, monitored human subjects in a specially designed room-sized respiratory calorimeter for 1 week, while at the same time calculating by the doubly-labeled water method the number of calories burned. Daily carbon dioxide production, water production, and energy expenditure were averaged from calorimeter data and compared to doubly-labeled water calculations for the same period, and for 1 week after exiting the chamber. The results indicate that (1) the doubly-labeled water

method as applied is valid for measuring energy expenditure, (2) multipoint calculation methods can be more precise than two-point methods, and (3) energy expenditure is greater when subjects are free-living than when under confinement.

- o Energy Expenditure Variation During Menstrual Cycle

Scientists in the ARS Energy and Protein Nutrition Laboratory in Beltsville, MD, have measured the energy expenditure of premenopausal women. In the first study, they measured resting energy expenditure (REE) by indirect calorimetry using a bedside canopy system. In another study, they determined 24-hour energy expenditure (24EE) using a room-sized calorimeter. In both studies, three measurements were made within a single menstrual cycle to coincide with fluxes in the menstrual hormones estradiol and progesterone. M1 was made at the beginning of the cycle when both hormones were low, M2 when estradiol was elevated, and M3 when progesterone rose. The REE was found to be similar at all times and not to vary with hormone changes. The 24EE was significantly lower during the M2 phase when compared to M1 and M3, but was not significantly related to either estradiol or progesterone levels. However, energy expenditure during sleep--which primarily reflects energy use for metabolic processes--rose significantly during M3, when progesterone increased. Thus, the female menstrual cycle was shown to contribute to a variability in energy expenditure, although the change was detectable only with 24-hour measurements.

- o Estimating Body Fat in African Americans

Generalized equations were developed in the mid-1980's, in white and racially mixed populations, to predict the percentage of body fat from body circumference measurements. Scientists at the ARS Energy and Protein Nutrition Laboratory in Beltsville, MD, recently tested the usefulness of these equations for also predicting percent body fat in African-Americans. They used deuterium oxide dilution and circumference measurements at 10 body sites to determine percent body fat in 90 subjects. They then applied three generalized equations and one nongeneralized equation to this population. Results indicate that an equation developed by the U.S. Army successfully predicts percent body fat for females. However, for males, an equation developed by Katch and McArdle gave only limited results. Using regression analysis to develop a prediction equation from this population, researchers concluded that differences in study conditions accounted for the limited results with the Katch and McArdle equation, and that there is no need to develop race-specific circumference equations.

- o Weight Loss, Energy Metabolism, and Protein Synthesis

Scientists in the ARS Energy and Protein Nutrition Laboratory in Beltsville, MD, have investigated the effect of moderate weight loss on the energy expenditure and protein synthesis in male subjects. The 14-week study involved 10 men with an average age of 43 years and an average 31 percent body

fat. After 2 weeks of maintenance calorie intake, the group was divided. Half continued on the weight maintenance diet (WM) while half was restricted to 75 percent of needed calories (WL). Both groups received the same diet, with only the quantity modified to provide the desired calorie intake level. Body weight did not change significantly in the WM group, but decreased significantly (10 kg average) in the WL group during the experimental period. While fat-free mass did not significantly change in the WM group, it decreased slightly (1.1 kg) in the WL group. Protein synthesis was found not to differ between groups or after weight loss. Energy expenditure (24-hour, 24EE) was greater for the WL group during the preliminary period, but the difference decreased by the end of the experimental period, likely owing to the reduction in body mass of the WL group. A significant decrease in 24EE also occurred after weight loss, although 24EE per unit body mass was unaffected by weight loss and did not differ between groups.

- o Effects of Overfeeding and Underfeeding on Energy Expenditure

Overfeeding and underfeeding studies have been conducted to investigate the importance of appetite and energy-wasting mechanisms in the long-term control of body weight. At the Human Nutrition Research Center on Aging at Tufts University scientists have studied the mechanisms of body weight regulation in young men of normal body weight leading unrestricted lives. Changes in total and resting energy expenditure, body composition, and subsequent voluntary nutrient intakes in response to overeating or undereating were measured for 21 days in 14 subjects consuming a typical diet. On average, 85-90 percent of the excess energy intake during overeating was deposited, and there was no detectable difference between individuals in their susceptibility to energy deposition. During underfeeding, body energy mobilization compensated for an average of 63 percent of the energy deficit. The resting metabolic rate, when averaged for fasting and fed states, increased during overfeeding and decreased during underfeeding, but at least some of this variance was due to changes in the obligatory expenditure associated with nutrient assimilation. Since no significant change in energy expenditure for physical activity or thermoregulation resulted from overfeeding or underfeeding, it may be said that energy expenditure did not substantially adapt to an increase or decrease in energy intake. However, significant adaptation occurred in subsequent voluntary energy intake, leading to a rapid normalization of body weight. Thus, adaptive changes in nutrient intakes are quantitatively more important than adaptive changes in energy expenditure in the regulation of energy balance in normal-weight men.

2. Dietary Lipids

- o Effects of Omega-3 Fatty Acid and Vitamin E Supplementation

Fish oil preparations containing polyunsaturated fatty acids of the "omega-3" type have become popular in recent years as dietary supplements to reduce the risk for heart disease. However, questions pertaining to the biochemical and physiologic effects of these preparations have persisted. Since ingesting

large amounts of polyunsaturated fatty acids may increase the risk for peroxidative deterioration of these acids, it is possible that the taking of fish oil supplements may lead to increased requirements for vitamin E as an antioxidant. Accordingly, researchers at the ARS Lipid Nutrition Laboratory in Beltsville, MD, have conducted a study to examine the extent of incorporation of dietary fish oil fatty acids into human red blood cell membranes. They also sought to determine if the fish oil supplementation alone--or, in concert with vitamin E--affects cell membrane physical chemistry and physiology. They found that the fish oil treatment resulted in only minimal incorporation of dietary fatty acids into the membranes, reduced membrane cholesterol, and increased membrane vitamin E content. Large doses of vitamin E further increased cell membrane vitamin E and fluidity, and it increased membrane insulin binding. The elevation in cell membrane vitamin E without large supplements suggests the existence of a cell-level mechanism that protects the integrity of human red blood cell membranes by controlling their vitamin E content.

- o Fish Oil Supplement Has Mixed Effects, But Salmon Shown Beneficial

The dietary benefits of marine fish oils have been much discussed, but studies at the ARS Lipid Nutrition Laboratory showed dietary fish oil supplements to cause a variety of changes. It stimulated glutathione S-transferase in white blood cells, though not in platelets, and it increased bleeding time; decreased insulin, glucagon, and somatomedin-C; reduced B-endorphin production; and slightly increased enkephalins. These varying effects suggest that fish oil supplements cannot be recommended until the pharmacology of marine oil is better understood. However, studies at the ARS Western Human Nutrition Research Center in San Francisco, CA, showed salmon, which contains fish oil, to be beneficial in moderation. Subjects who ate 1 pound of salmon daily for 40 days experienced an average 24 percent reduction in prostaglandin synthesis, a significant rise in the so-called "good" cholesterol, and a slight decrease in triglycerides. Another salmon consumption study showed no suppression of any of the immune status indices.

- o Effects of N-6 Polyunsaturated Fatty Acids on Immune Status

Several health organizations have recommended a reduction in the concentration of total calories from fat and an increase in the percentage of calories from n-6 polyunsaturated fatty acids (PUFA) to improve cardiovascular health. However, diets rich in n-6 PUFA have been reported to suppress immune status in animal models, and the effects of such dietary changes upon human immune status are not well known. At the Western Human Nutrition Research Center ARS scientists examined the effect of lowering dietary fat content while adding two levels of PUFA (3.1 or 9.1 energy percent en%) upon the immune status of seven healthy women. Lowering the fat content of the diet from 41 en% to 26 or 31 en% for 40 days enhanced several indices of the immune status, although there was no difference in the values of those or other tested indices, based upon the PUFA content of the diets. Thus, results indicate that a reduction

in the intake of total fat, with a moderate increase in the percentage of n-6 PUFA, may be beneficial not only for cardiovascular health, but also for improving immunocompetence.

- o Effect of Dietary Fat/Cholesterol Level on Young Pigs

Research has indicated that pigs are appropriate models for humans in the study of the relationship between cholesterol levels and heart disease. Therefore, ARS researchers at the Childrens Nutrition Research Center in Houston, TX, have sought to determine the effects of a high-fat, high-cholesterol diet upon the cholesterol of two special groups of young pigs--one bred for natural high levels of serum cholesterol and the other, bred for low serum cholesterol levels. They discovered that when both groups were fed a high-cholesterol diet, cholesterol concentrations increased at the same rate. This suggests that dietary cholesterol levels may be more important than genetic backgrounds of natural high or low serum cholesterol in increasing cholesterol levels. Test data did not support the hypothesis that growing pigs selected for high serum cholesterol respond differently from those selected for low serum cholesterol when allowed the unrestricted consumption of a high-fat, high-cholesterol diet. While the effect of genetic background persisted throughout the 13-week experiment, no interaction between diet and genetic background in serum total cholesterol was observed.

3. Dietary Fiber and Carbohydrates

- o Rice Bran Lowers Cholesterol

ARS studies suggest that rice bran may lower serum cholesterol levels by unique mechanisms, thus making it a valuable addition to American diets. At the Western Regional Research Center in Albany, CA, the cholesterol-lowering effects of full-fat and defatted rice bran and of rice bran oil were investigated in hamsters. Results showed that stabilized full-fat rice bran significantly lowered plasma cholesterol in both normal hamsters and those with elevated cholesterol. However, recombined defatted rice bran and rice bran oil were not as effective as full-fat rice bran. Scientists at the Human Nutrition Research Center on Aging showed that the greatest reduction in serum cholesterol in monkeys fed rice bran oil occurred in those with the highest initial cholesterol levels. Whereas there was a correlation between the amount of rice bran oil in the diet and the degree of serum cholesterol lowering, the results could not be explained by the fatty acid composition alone. Both studies suggest that another rice bran oil factor is active in producing the cholesterol-reducing effect.

- o Effect of Dietary Fiber on Human Glucose and Insulin Response

As persons age, their ability to metabolize carbohydrates changes and elevated blood glucose or insulin levels are often identified by glucose tolerance tests. The simplest treatment would be to use dietary modifications to lower the glucose response, since some food fibers have been shown to be effective

in that regard. Corn starch in which 70 percent of the starch is in the form of amylose (a straight-chain structure, biochemically speaking) rather than as amylopectin (the more common branched-chain structure) has already been reported to lower insulin response. Therefore, scientists in the ARS Carbohydrate Nutrition Laboratory have administered starch in several forms (corn starch with 70 percent of the starch in the form of amylopectin, or amylose made with or without corn meal from the respective corn type). They found that insulin response--but not glucose response--was significantly decreased when amylose was consumed, compared to the response after amylopectin, in both normal and high-insulin responding subjects. Corn fiber did not significantly change any response curves; and no interaction was found between fiber, starch, or insulin response to glucose. Thus, the amount of fiber present does not appreciably affect human glycemic response, but amylose starch may well prove beneficial in long-term dietary use.

4. Vitamins and Minerals

- o Low-Carotenoid Diets Quickly Reduce Plasma Carotenoid Levels

The human body uses carotenoids (colored substances found in fruits and vegetables) as part of its defense system to protect cells and tissues from the damaging byproducts of oxygen utilization (called "free-radical" damage). Until recently, the effect of a low-carotenoid diet on depletion of specific carotenoid levels in the blood had not been known. Now, scientists at the ARS Western Human Nutrition Research Center have completed a 3-month vitamin C deficiency study during which healthy men were fed a diet containing no fruits or vegetables. In addition to monitoring the effects of such a diet on vitamin C levels, researchers also analyzed for five specific carotenoids in blood plasma taken at four points throughout the study. Blood levels of all five declined rapidly from the start and decreased to half of their initial values after 2-8 weeks, depending on the specific carotenoid. Because the decline was not found to be linear over the entire study period, researchers speculate that the human body may maintain at least two pools of carotenoid compounds, with one pool having a more rapid turnover rate than the other. Furthermore, since a major decline in plasma carotenoid levels occurs within the first 2 weeks of a low-carotenoid diet, determination of levels of these compounds may be useful only in the assessment of short-term dietary intake. However, the most significant finding is that a lack of fruits and vegetables in the diet will quickly lower blood levels of both important carotenoids and vitamin C, thus lowering antioxidant protection, and possibly permitting increased oxidant-related damage.

- o Endogenous Retinoids Not Found To Cause Acne

Acne is usually linked to the physiologic events of puberty, but the etiologic factor(s) determining expression of the skin disorder are largely unclear. When given in large amounts, chemically synthesized vitamin A acids that are naturally present in small amounts in human blood can act as powerful anti-acne agents. So scientists at the Human Nutrition Research Center on

Aging at Tufts University have measured blood levels of two powerful anti-acne agents--retinol and retinoic acids--in both normal subjects and those with acne to determine if the latter might naturally have lower ambient levels of vitamin A acids circulating in their blood. Despite the performance of numerous analyses of retinoids, carotenoids, and other blood constituents, no significant difference was found between normal subjects and acne patients. Therefore, it may be concluded that serum retinoids are probably not involved in endogenous protection against acne.

- o Vitamin B6 Needed for the Aging Immune System

Aging is associated with a decline in immune function. Such decline in immunological vigor may contribute to an increased incidence of infectious diseases and cancer in the aged. As the elderly are at risk for low intake of vitamin B6, the deficiency status of this vitamin has been investigated at the ARS Human Nutrition Research Center on Aging using eight healthy older adults. The study consisted of a baseline period, a vitamin B6 depletion period, three repletion phases, and a final-phase ingestion of 50 milligrams of vitamin B6. A significant decrease in indicators of immune function responses and IL-2 production was exhibited following the depletion stage. With each successive repletion phase, the mitogenic response and IL-2 production recovered in a dose-dependent manner. Other indicators of B6 status were consistent with these findings. It is concluded that vitamin B6 deficiency caused a decrease in measured factors that is reversible by vitamin B6 repletion. The results suggest that healthy older adults may require a greater dietary vitamin B6 intake than is currently recommended for this age group.

- o Vitamin C Intake and Blood Pressure in the Elderly

Elevated blood pressure (BP) is a powerful determinant of cerebrovascular and coronary heart disease. Although great strides have been made in the detection and treatment of hypertension since the 1960's, only limited progress has been made in preventing age-associated BP increases. Of course, the importance of nutrition in the control of blood pressure is well documented, with obesity, dietary sodium, and alcohol being associated with higher BP, and increased intakes of potassium and calcium associated with lower BP. Since inverse associations between BP and vitamin C have also been reported, scientists at the Human Nutrition Research Center on Aging at Tufts University undertook an analysis of data from a large cross-sectional study of health and nutrition in a group of noninstitutionalized elderly subjects. After adjusting for potential confounding by other dietary factors such as sodium and potassium, they found half as many cases of elevated BP in subjects consuming 240 milligrams or more per day of vitamin C than they did in those consuming less than 60 milligrams per day. This finding lends support to the hypothesis that diets low in vitamin C are related to increased BP. However, further research is required to test whether the vitamin C itself--or some other component of a low vitamin C diet--is responsible for the elevated BP.

- o Effects of Vitamin C Deficiency Upon Immune and Antioxidant Chemistries

While the vitamin C requirement to prevent the frank deficiency symptoms of scurvy is well known, the requirement to optimize immune functions and oxidant defense has not yet been determined. Accordingly, scientists at the ARS Western Human Nutrition Research Center have undertaken the measurement of immune functions and oxidant defense in healthy subjects fed experimental diets containing various amounts of vitamin C. No significant changes in immune functions were found. However, changes did occur in both the blood biochemistries that are associated with oxidant stress and the indicators of increased oxidative damage (to sperm DNA and the colon). These findings lead to a conclusion that even moderate vitamin C deficiency--in the absence of scurvy--causes an alteration of antioxidant chemistries and may permit increased oxidant damage.

- o Vitamin C Protects Human Sperm

The DNA within each human cell that carries the code for cell duplication is vulnerable to damage from the body's natural oxygen utilization (oxidation). Vitamin C is part of the body's antioxidant defense system, which protects cells and tissues from oxidation byproducts. Scientists at the ARS Western Human Nutrition Research Center have sought to learn whether vitamin C is important for protecting cells' DNA by measuring oxidatively modified DNA products in human urine, white blood cells, and sperm cells of healthy men fed experimental diets containing various amounts of vitamin C. They found no effect of dietary vitamin C intake on DNA damage products in urine or in white blood cells. However, levels of DNA damage in sperm cells increased when subjects were fed low-vitamin C diets. Thus, it appears that dietary vitamin C protects human sperm from oxidative DNA damage that could otherwise affect sperm quality or increase the risk of birth defects.

- o More To Be Learned About Dietary Copper Deficiency and Heart Disease

Copper, a trace mineral element known to be important for many physiological functions, is believed to be essential to the structural and functional integrity of the human cardiovascular system. This has certainly proved true in rodents, the hearts of which become enlarged, mechanically weak, and structurally aberrant when copper-deficient diets are fed. Scientists in the ARS Vitamin & Mineral Nutrition Lab in Beltsville, MD, have sought to determine whether comparable changes occur in the hearts of pigs, which are similar to humans in both nutritional requirements and cardiovascular system structure. Their tests have demonstrated that pigs do experience significant cardiovascular changes when fed suboptimal amounts of copper and that they do represent a useful model for addressing the mechanisms whereby the changes occur.

D. Food Composition and Nutrient Bioavailability

1. Improved Methods

- o Laser/Microbe Method Speeds Bioassay for Water-Soluble Vitamins

The currently used microbiological method to detect and quantify water-soluble vitamins requires 16-24 hours to complete. Scientists at the ARS Nutrient Composition Laboratory in Beltsville, MD, have now developed an improved method that uses the same microorganisms, but requires only 6 hours. Their approach is based on detecting the differences in growth rates of microorganisms as they respond to varying amounts of available vitamin. It uses differential light scattering from a laser light source to measure growth rates during the early, exponentially fast microbial growth phase, whereas the official method of the Association of Official Analytical Chemists measures the total amount of growth during the stationary growth phase. The technique was developed for the determination of niacin using Lactobacillus plantarum. The presumption is that it may be modified to detect and quantify other water-soluble vitamins, as well.

- o A New Method To Determine Chromium in Foods and Biological Materials

As more is learned about the dietary importance of the so-called trace elements in human nutrition, it becomes increasingly important to have the means available to measure the minute quantities of these nutrients that are present in foods. At the ARS Nutrient Composition Laboratory in Beltsville, MD, researchers have developed a method to detect the presence of the trace element chromium in food samples and in other biological materials. Samples are dry-ashed in a muffle furnace, and analyzed by graphite furnace atomic absorption spectrometry. Validated by analyzing a wide range of reference materials, the method has subsequently been used for analyzing a wide variety of food samples, as well as beverages, biological fluids, and solid samples prepared as slurries.

- o New Method for Measuring Selenocysteine

All of the biological functions of the essential trace element selenium in animals and humans are performed by proteins that contain the amino acid selenocysteine. Recently discovered to be the 21st protein amino acid, selenocysteine has its own genetic code and specialized mechanisms for incorporating itself into selenoproteins. This amino acid is very important to understanding the biochemical basis underlying the human nutritional requirement for selenium. Unfortunately, the methods available for measuring selenocysteine have required the use of radioactive selenium, which is not desirable for studies of human selenium metabolism. Scientists at the ARS Western Human Nutrition Research Center have now devised a new method--the first developed specifically for selenocysteine. It is based on the selective

reaction of selenocysteine with a fluorescent compound, IAEDANS. Already found to work well in plasma and serum, the new method may be adaptable to other types of samples and promises to be a valuable tool for researchers studying selenocysteine metabolism.

2. Food Composition

o Cholesterol Data for Eggs Revised for Greater Accuracy

Public concern with respect to dietary cholesterol has led to reduced egg consumption. Subsequent concern about the diminished use of this highly nutritious food led ARS to cosponsor with the U.S. egg industry a nationwide study to update egg cholesterol data. Chemists and nutritionists in the ARS Nutrient Composition Laboratory used analytical quality control materials developed by the National Institute of Standards and Technology (Department of Commerce) to select a contractor to conduct the two-phase survey. Between June 1988 and May 1989, eggs were collected from 122 of the Nation's top 200 egg handlers in six geographic regions, representing 67 percent of U.S. monthly egg production. Rigorous quality control was maintained throughout the survey. Revised nutrient data for cholesterol in eggs are now available to update various public and private nutrient data bases. This information is being used in the National Nutrient Data Bank.

o Table Developed To Show the Carotenoid Content of Fruits and Vegetables

Carotenoids are substances found in foods--especially in fruits and vegetables--which may reduce the risk of certain cancers. To learn more about the role of carotenoids in the prevention of disease, researchers need to know the amount of carotenoids found in commonly eaten foods. Thus, scientists in the ARS Nutrient Composition Laboratory in Beltsville, MD, have developed a table, using an artificial intelligence system, to evaluate the quality of existing data for food carotenoid levels. The data were evaluated by examining the number of samples analyzed, scheme used for sampling, handling and storage of samples, method used for analysis, and use of quality control procedures. Those values judged to be acceptable were combined to create a table which contains the minimum, maximum, and median levels of beta-carotene, alpha-carotene, lutein, lycopene, and beta-cryptoxanthin in more than 120 foods. A "confidence code" indicates the expected reliability of each median value. This data base of food carotenoid contents should be highly useful in the estimation of dietary amounts of specific carotenoids.

o A Nationwide Study of Selenium in Beef Products

Selenium is known to be an essential dietary nutrient, and beef is a major selenium source for the U.S. population. Therefore, it is important to know the variability of selenium in beef produced and sold throughout the Nation. Scientists at the ARS Nutrient Composition Laboratory have measured the selenium content of more than 200 samples of retail beef cuts gathered from

diverse markets. Included were uncooked beef cuts, ground beef, and fast-food hamburgers. Analyses were made by the modified selenium hydride generation procedure, and the accuracy of analyses was monitored by the use of National Institute of Standards and Technology Standard Reference Materials. Researchers found the mean selenium concentration in uncooked beef/separable lean to be 18 micrograms per 100 grams; the mean values for ground beef and for hamburgers were 13 and 20 micrograms per 100 grams, respectively.

o Average Nutrients in Total U.S. Mixed Diet

Because it is difficult to estimate the nutritional content of the average American diet, the Food and Drug Administration (FDA) has developed a Total Diet Study (TDS) that includes 201 food items that are representative of U.S. dietary intake. Scientists in the ARS Nutrient Composition Laboratory in Beltsville, MD, recently performed analyses to determine the nutrient and inorganic constituents in mixed diet composites prepared from these 201 common foods. The FDA's estimates of the average quantities of foods condensed by various sex/age groups are based on USDA's Nationwide Food Consumption. They used the quantity of foods consumed by the average 25- to 30-year-old male--the highest intake group in the FDA's TDS scheme--as the basis for preparing the total mixed diet composites. These were then analyzed for concentrations of proximates; vitamins; fiber; phytate; and macro, essential, and toxic elements. The inorganic constituents were the macro elements calcium, chlorine, magnesium, phosphorus, potassium, and sodium; the trace elements were aluminum, antimony, arsenic, bromine, cadmium, cesium, chromium, cobalt, copper, gold, iodine, iron, lead, manganese, mercury, molybdenum, nickel, rubidium, scandium, selenium, strontium, tin, tungsten, vanadium, and zinc. A comparison of FDA and ARS data shows that for the 20 elements which have been investigated by both approaches, the results are in close agreement. Thus, this ARS study showed that the total mixed diet composites can be a valuable supplement to data obtained by the TDS scheme, and it has already proven useful for assessing the contents of proximates, fiber, phytate, and selected vitamins. These analytical data are part of an ongoing nutrition project sponsored by the International Atomic Energy Agency, Vienna, Austria.

o Effect of Cooking Upon Major Carotenoids

Carotenoids are the compounds that give color to fruits and vegetables, and also seem to be associated with reduced incidence of several types of cancer. Because of this potential beneficial effect on human health, it is important to know the effect of cooking upon the level of carotenoids in foods. Scientists in the ARS Nutrient Composition Laboratory in Beltsville, MD, recently evaluated the carotenoid contents of tomatoes, broccoli, green beans, and spinach prepared by four cooking methods: microwaving, boiling, steaming, and stewing. Extensive study of the data showed that the so-called epoxycarotenoids were somewhat sensitive to the cooking conditions, whereas lutein and hydrocarbon carotenoids (e.g., alpha-carotene, beta-carotene, lycopene, neurosporene) survived the heat treatment.

- o National Nutrient Data Bank

HNIS continues to maintain and expand components of the National Nutrient Data Bank (NNDB) as the primary mechanism for collecting, evaluating, storing, and collating data on nutrient composition of foods. Products of the NNDB are reference values for over 60 food components in thousands of foods Americans consume, including many foods consumed primarily by specific ethnic groups. They are presented in published tables and reports, provisional tables, and machine-readable forms for a wide variety of users. The products are widely recognized as authoritative and are used throughout the world. Of special importance are the data bases prepared for use in assessing the nutrient content of diets reported in large-scale dietary intake surveys conducted by HNIS and by the National Center for Health Statistics (NCHS) in DHHS. In addition, HNIS has supplied the Food and Drug Administration with nutrient data values for raw fruits and vegetables and cooked fish in response to the Nutrition Labeling Act of 1990 that specifies voluntary nutrition labeling of the 20 most frequently consumed raw fruits and vegetables and cooked fish.

The NNDB is expanded on a continual basis to include results from new analyses conducted by industry, government, universities, and from extramural analyses funded by HNIS. Data reliability is emphasized by utilizing plans representing the national distribution of food types, (1) evaluating performance on check sample analyses during the contractor selection process, (2) requiring validated analytical methods and documented quality control procedures during contract performance, (3) promoting uniformity of procedures by encouraging cooperation among contractors, including participation in annual meetings of principal investigators, and (4) developing characterized reference materials through extramural contracts.

Research emphasis is in two areas: food components believed to be important to health promotion and disease prevention and research to fill knowledge gaps for the data base or to monitor published data on nutrient composition of foods.

Extramural contracts are used to monitor the nutrient analysis of selected key foods in the U.S. food supply. Specialized research continues on a number of nutrients in related foods including fatty acids (including trans fatty acids), plant sterols, tocopherols (including tocotrienols), cholesterol, and dietary fiber.

- o Nutrient Data Base System for Large-Scale Dietary Intake Surveys

HNIS is responsible for maintaining the Survey Nutrient Data Base System for developing and documenting special data bases to assess the content of food energy and 27 nutrients in diets reported in dietary intake surveys. The Survey Nutrient Data Base System was updated to include all values needed for data analyses of the USDA 1989 and 1990 Continuing Surveys of Food Intakes by Individuals and data for new foods being reported in the Department of Health

and Human Services (DHHS) National Health and Nutrition Examination Survey III (NHANES), which is currently being conducted.

Planning is underway to expand the Survey Nutrient Data Base System to include a mechanism for tracking changes to food composition values. These changes occur not only as a reflection of trends in the marketplace, but also as a result of normal data improvements. Data improvements result from increased numbers of samples as well as improved analytic technology. This expanded system will provide the ability to adjust nutrient intake estimates from surveys conducted in previous years to account for improvements in the food composition values, facilitating the analysis of trends in nutrient intakes over time.

- o Revision of Agriculture Handbook No. 8, "Composition of Foods...Raw, Processed, Prepared"

HNIS continued the revision and publication of major food sections for "Composition of Foods...Raw, Processed, Prepared," Agriculture Handbook No. 8. The section on Snacks and Sweets (AH 8-19) was revised and published in August 1991. Data are provided for 301 items including 74 snacks and 227 sweets. These complex, multi-ingredient foods include both plant and animal products. A number of these foods are new to the market. The 1963 edition of the handbook contained only 76 items. Brand names have been used in this section to assist users when a generic description would be difficult to identify. Brand names are used solely for identification purposes and do not imply endorsement of a particular product.

The third supplement to Agriculture Handbook No. 8 will be issued. The supplements are being issued annually in order to update previously published data and to add data for new items. The next supplement will include composition data for 85 new and revised food items. The new and revised data are to supplement 10 of the 21 handbook sections.

- o Provisional Tables on Dietary Components

Provisional tables of food components of special interest to professionals are issued for a selected number of frequently consumed foods as reliable data become available. An updated provisional table on "The Content of Vitamin K in Selected Foods" was released. Cooperation was continued with the Human Nutrition Research Center on Aging at Tufts University, Boston, MA, for vitamin K analysis to generate a broad data base on key foods.

A provisional table on "The Vitamin D Content of Foods" was published in response to demand for these data by nutritionists and members of the medical profession.

- o Industry, Academia, Government Interaction

An HNIS Nutrient Data Research Branch (NDRB) Consultant Panel was established to address issues and make recommendations to NDRB related to food composition. The three-member panel has one member representing industry, one from academia, and a non-USDA government member. The members' qualifications cover the areas of analytical methods, data bank use, and nutrient data generation. The Panel met in June 1991 and will continue to meet annually each June. The Panel plans additional communications with NDRB throughout the year.

- o Food Composition of Meat Cuts

Data from the nationwide pork market basket study on marketing practices and nutrient composition of pork and other recent research reports were evaluated and used to update the nutrient composition data in a revision of Agriculture Handbook No. 8-10. The new values show that most cooked fresh pork loin cuts are over 30 percent lower in fat than shown in the last Handbook No. 8-10 section on pork products published in 1983.

- o Nutrient Data Bank Bulletin Board

The Nutrient Data Bank Bulletin Board, developed by HNIS as a public service, is available to individuals and institutions to transfer nutrient data and announcements about HNIS publications and relevant conferences directly to their own computers. This information is updated and revised monthly. The board, which operates 24 hours a day, 7 days a week, has had over 100 users per month from nearly every State, as well as some foreign countries. The information and files in the bulletin board were also made available to users of the Internet System run by the National Science Foundation. Release 4 of the Survey Nutrient Data Base was added to the list of data files available. Revised data on the nutrient content of fresh pork were also released on the bulletin board in advance of the printed publication. Other files currently on the bulletin board are the Dietary Analysis Program; and data from Home and Garden Bulletin No. 72, "Nutritive Value of Foods;" Home Economics Research Report No. 48, "Sugar Content of Selected Foods;" and provisional tables on vitamins D and K.

3. Bioavailability

- o Does Too Much Dietary Fiber Interfere With Nutrient Absorption?

With the rapidly escalating interest in dietary fiber consumption, concern has arisen as to whether too much of this good thing might not have a deleterious effect. Some have questioned whether the increased speed of passage of high-fiber foods through the gastrointestinal (GI) tract might interfere in some way with the absorption of nutritionally important minerals. To help answer this question, scientists in the Food Physical Chemistry Research Unit

at the National Center for Agricultural Utilization Research in Peoria, IL, have developed a mathematical model. This model is based upon analyses of the mineral contents of corn bran (a common source of dietary fiber) and GI fluids. Its general nature is such that it should permit application to other dietary fibers and help predict the impact of fiber consumption on mineral adsorption.

o Tannins in Plants May Inhibit Iron Availability

Poor absorption of dietary iron contributes to the worldwide problem of iron-deficiency anemia. Scientists at the ARS Plant, Soil, and Nutrition Laboratory in Ithaca, NY, are trying to discover why the iron in plant foods is less available for uptake and use than the iron in foods of animal origin. They suspect that the tannins that occur in many plant foods (e.g., fruits, some dry beans and cereals, tea, wine) may be the culprit. Tannins may also depress food intake, inhibit digestive enzymes, reduce nutrient digestibilities, and damage the intestinal lining. Feeding studies with rats have shown--under some conditions--reduced iron absorption, with a marked loss occurring in animals on high-tannin diets. While the feeding of rats with tannins extracted from legumes was found to impair iron absorption, the impairment became marked only after several days of feeding, and the inhibitory effect was greatest in rats already suffering from anemia. In considering these findings, it is important to keep in mind that, while iron-binding compounds extracted from legumes may have been found to depress iron absorption, the response of animals and people to specific chemicals in food may be different when the compounds are consumed as parts of complex diets than when fed separately. Additional studies are needed to depict the chemistry of legume tannins, assess interactions of tannins with various other food components, and determine the link between tannin content and the bioavailability of iron in legumes normally eaten by people. Increasing such knowledge of the factors in plant foods that limit iron absorption could contribute to a reduction in the widespread incidence of iron-deficiency anemia.

o Effects of High Vitamin C Intake on Urinary Iron Excretion

Vitamin C is known to enhance iron absorption if ingested with a meal, and to aid in replenishing iron stores of individuals in whom they have become depleted. However, iron-replete individuals do not show an increase in iron stores after several months of vitamin C supplementation. Scientists in the ARS Vitamin & Mineral Nutrition Laboratory in Beltsville, MD, have been seeking to understand why this is so, despite a response to the iron-enhancing effect of vitamin C in single meal iron absorption tests. Since studies had already shown that vitamin C supplements increase the urinary excretion of chelated iron during chelation therapy for iron overload, researchers investigated the effect of high vitamin C intake upon urinary iron excretion by ostensibly normal men. They found that urinary iron increased about 30 percent when 12 subjects consumed 500 milligrams of vitamin C with each of their two main meals (self-chosen diets) each day for 8 weeks. Although this

percentage increase seems large, the actual amount represented less than 1 percent of the amount required for the average man to maintain body-iron balance. Thus, the magnitude of the increase in urinary iron excretion was small and insufficient to negate the benefit to iron stores derived from the enhancing effect of vitamin C on absorption of dietary nonheme iron. Therefore, it must be concluded that the lack of increase in iron stores by normal iron-replete men consuming high amounts of vitamin C was not due to a concomitant increase in urinary iron excretion. Some other explanation must now be explored.

o Selected Foods and Supplements To Increase Plasma Carotenoids

Current epidemiologic evidence indicates a possible association between increased dietary consumption of certain fruits and vegetables and lower rates of several cancers. Interest has centered on carotenoid pigments as the food constituents responsible for the cancer-modifying effect, and this has led to renewed efforts to assess nutritional and metabolic aspects of carotenoids. Earlier studies of plasma changes following the ingestion of vegetables were limited to measuring plasma total carotenoid levels in relatively small numbers of subjects for a short period of time. In a study at the ARS Vitamin & Mineral Nutrition Laboratory in Beltsville, MD, researchers have determined the changes in four major plasma carotenoid fractions--alpha-carotene (AC), beta-carotene (BC), lutein/zeaxanthin (LZ), lycopene (LY)--in 30 healthy men after 6 weeks of ingesting either a food high in one or more carotenoids, or a dose of purified BC. Significant BC increases were observed, relative to a placebo group, in both the BC supplement and carrot-fed groups. AC increased significantly in the carrot group. LZ increased for subjects fed broccoli, but plasma LZ levels were significantly lower in subjects receiving the BC supplements, which suggests an interaction. LY levels declined in all groups except those receiving tomato juice. Overall, purified BC produced a greater plasma response than similar quantities of carotenoids from food sources. However, since eating carrots was found to increase the blood levels of both AC and BC, and tomato juice was found beneficial in maintaining LY blood levels, it may be said that some foods can indeed increase the plasma levels of certain carotenoids.

E. Food and Nutrition Monitoring Research

1. U.S. Food and Nutrient Supplies

a. Nutrient Content of the U.S. Food Supply

Food supply determinations are one of five components of the National Nutrition Monitoring System. HNIS annually estimates per capita daily levels of food energy and 24 nutrients and food components in the U.S. food supply. Estimates of the nutrient content of the food supply are derived by using data on quantities of foods available for consumption per capita per year and data on the nutrient composition of foods. Because estimates are based on food disappearance data, nutrient levels represent what is available for

consumption, rather than actual nutrient intake by individuals. The nutrient content of the U.S. food supply series dates from 1909.

Nutrient estimates for the food supply series were updated in 1991 in an administrative report entitled "Nutrient Content of the U.S. Food Supply for the years 1909-1988." Excerpts of the report were highlighted in an article for the National Food Review and data were extracted for publication in "Statistical Abstracts of the United States, 1991: The National Data Book," U.S. Department of Commerce, Bureau of the Census. Here are some highlights of the changes in the nutrient content of the food supply between 1968 and 1988:

The food energy level of the food supply increased from 3,300 calories per capita in 1968 to 3,600 calories in 1988. This increase reflects higher levels for all three of the energy-yielding nutrients--fat, carbohydrate, and protein. Protein accounted for 1 percent of the calories.

Fat was almost at its peak in 1988, having increased from 158 grams per capita in 1968 to 168 grams in 1988. This gain was due to an increase in fat associated with vegetable sources, reflecting increased use of oils and shortening. However, animal sources accounted for the largest proportion of fat, although their share declined from 65 to 53 percent between 1968 and 1988. Cholesterol declined from 500 to 440 mg per capita, due mostly to decreased use of eggs.

The level of carbohydrate increased considerably, from 379 grams per capita in 1968 to 425 grams in 1988. Most of the increase before 1984 is due to increased use of high-fructose corn syrup. Greater consumption of grains--primarily wheat flour and rice--is mostly responsible for the marked increased in carbohydrate after 1984.

The increase in protein, from 98 to 105 grams, was due mostly to greater use of poultry. Greater use of grain products, cheese, and lowfat milks also contributed to the higher level. Except for vitamin B12, levels for all vitamins and minerals were higher in 1988 than in 1968.

2. Food Consumption Surveys

a. Collecting and Reporting of Nationwide Survey Data (HNIS)

During the year, work continued on four different but concurrent nationwide food consumption surveys involving all stages of the survey process simultaneously. Survey activities were in six main areas: (1) Conducting analyses of nonresponse in the 1987-88 Nationwide Food Consumption Survey (NFCS), completing documentation and release of public use data tapes, and preparing reports for publication; (2) Monitoring contractor performance for the 1989, 1990, and 1991 Continuing Survey of Food Intakes by Individuals (CSFII); (3) Supporting technical aspects of data processing and analysis and preparing for publication of descriptive tabular results from the 1989 and

1990 CSFII and the follow-up Diet and Health Knowledge Survey (DHKS); (4) Launching the 1991 CSFII and DHKS; (5) Planning for the next CSFII cycle in 1993-95; and (6) Planning for other activities conducted as part of the NNMS.

o Nationwide Food Consumption Survey 1987-88

The 1987-88 NFCS is the seventh nationwide survey on food consumption conducted by USDA since the first in 1936-37. Sample selection, data collection, and data processing were conducted under contract. The NFCS included two components: a household component which included detailed information on the food used by the entire household during a 7-day period and the price paid for that food and an individual component which included the food eaten at home and away from home by each household member over a 3-day period. Questions were asked about demographic and socioeconomic characteristics of the household and household members. Data collection began in April 1987 and was completed in August 1988. Information from the household and individual basic (all income sample) are available on data tape, and work is underway to develop two tabular reports.

Data from the survey have been compared with data from a similar survey conducted in 1977-78. Results indicate that among the main food groups, the mean intakes of only grain products and beverages increased. Mean intakes of meat, poultry and fish; milk products; vegetables; and eggs all declined. The mean intake of fruits remained about the same. Among food subgroups, survey respondents reported eating less beef and pork and drinking less whole milk. They reported eating more mixtures from the meat, poultry, and fish group or the grain products group and drinking more lowfat and skim milk and carbonated soft drinks.

The NFCS had a low response rate. HNIS conducted numerous statistical analyses using NFCS data to explore the effect of the nonresponse on estimates of food and nutrient intakes. In addition, HNIS requested that the Life Sciences Research Office (LSRO) of the Federation of American Societies for Experimental Biology conduct an independent review of the effect of nonresponse on NFCS estimates and make recommendations about possible uses of the data. Work is underway in HNIS to prepare and publish a report that will include the nonresponse analyses and the LSRO findings.

The NFCS data are an important resource, and data should be made available to the public provided users are made aware of the nonresponse issue.

o Continuing Survey of Food Intakes by Individuals

The 1989-91 CSFII is the second in a series of USDA surveys responsive to National Nutrition Monitoring and Related Research Plan requirements for the continuous collection, processing, and analysis of dietary status data. The survey includes two separate samples including all members in 1,500 households in the general population and 750 households in the low-income population. CSFII 1989-91 is designed to obtain 3 days of food intake data from all

members of the household in addition to sociodemographic data and general questions on the respondent's diet and health. Data collection for both the 1989 and the 1990 CSFII was completed on schedule, and work is underway to prepare the data for release. For each year, data tapes to be released will include information from both the CSFII and the DHKS (see below) to facilitate analyses of the relationship between an individual's intake and his or her attitudes and knowledge about diet and health. Reports on the CSFII/DHKS will begin to be issued during 1993. In addition, data from several years of CSFII data collection will be combined to report the food and nutrient intakes by multiple sex/age groups.

Data collection for the 1991 CSFII began on April 1, 1991, and is proceeding according to the established schedule. In lieu of the 1992 survey, contract studies are evaluating current survey methodologies seeking ways to improve future survey results including the sampling of various subgroups. Planning is underway for the CSFII 1993-95.

- o Diet and Health Knowledge Survey

Beginning with the 1989 CSFII, a new type of survey was initiated to assess knowledge and attitudes about the USDA/DHHS Dietary Guidelines for Americans and about food safety issues. It is called the Diet and Health Knowledge Survey (DHKS) and is conducted as a telephone followup to the CSFII. The respondent is the main meal planner/preparer in the household. This annual survey will add to existing data available for understanding factors that affect food choices. Preliminary data suggest that people have difficulty rating the nutritional quality of their diets with respect to nutrients of public health significance such as fat and sodium.

They also lack knowledge about current dietary recommendations. For example, about one-third think that eating five daily servings of fruits and vegetables is not at all important. This survey contributes new information to our national nutrition monitoring system that is needed for developing and targeting nutrition education materials and programs. A technical report that links the 1989 CSFII and DHKS is in draft stage. The report will provide information about how people's attitudes and knowledge about Dietary Guidelines concepts affect dietary behavior and adherence to the Guidelines. It will also provide baseline data for tracking progress toward meeting several national health objectives for the year 2000. Data collection for the 1990 DHKS has been completed, and data processing is underway. Data collection for the 1991 DHKS is ongoing.

- o Food Intake Analysis System

Distribution began for the Food Intake Analysis System, Version 1.0, which was developed cooperatively by HNIS and the University of Texas School of Public Health. This system integrates several components of the HNIS individual intake survey technical support system, including the nutrient data base, with user-friendly computer software for performing dietary intake assessments.

The new software was designed to facilitate research for dietary assessment of population groups. Specifically, nutrient content of food items as used by HNIS for nationwide dietary intake surveys can be modified easily to account for regional or ethnic differences in food preparation practices. Extensive testing was conducted and refinements were made to the system before its release. In addition to HNIS and the University of Texas, test sites included ARS, the U.S. Army Research Institute at Natick, MA, and the University of New Mexico.

The Food Intake Analysis System is being incorporated within a survey operations management network for use by HNIS. This PC network is being designed for two purposes: (1) to provide an efficient state-of-the-art system for survey contractors to use for coding dietary recall and food intake records, and (2) to provide automated procedures for HNIS to efficiently maintain the food code system and to monitor and measure quality of a contractor's performance. The coding process, including the contractor's communications with HNIS to solve coding problems, is the most time-consuming part of processing survey data. The new system will streamline this process, and problems can be transferred electronically to HNIS for resolution. The network design of the system will permit HNIS to have a direct link to the coding process and to obtain periodic reports measuring actual performance of coders and supervisors against HNIS expectations. Indirect measurements of interviewer performance can also be made through this system. Testing of the network and preparation of documentation and training materials are being developed so that a completed system will be available for trial by prospective contractors in 1992.

- o Food Grouping System

During 1991, HNIS completed planning and design studies required for the development of an automated Food Grouping System (FGS). The objective of the FGS is to expedite analysis of food consumption data as reported in national surveys of food consumption by individuals (e.g., NFCS, NHANES) in terms of ingredients or agricultural commodities. Reports of such analyses may include consumption data for specific fruits and vegetables (such as apples and tomatoes)--whether consumed raw, cooked, processed, or as part of a food mixture--that can be linked with other data bases such as data on pesticide residues in the same agricultural commodities; or commodity consumption data by various socio-demographic characteristics, such as sex, age, region, race, income, or education level.

The FGS is being developed in cooperation with the Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA). In addition, it is a major component of the USDA Pesticide Data Program (PDP), a comprehensive, multi-agency program to collect and analyze pesticide use and residue data regarding actual concentration levels in food. The FGS will be accessible by EPA and FDA for use in their Dietary Residue Exposure System and Total Diet Study, respectively.

- o Nutrition Monitoring: USDA/HNIS Resources Conference

HNIS conducted a 2-day conference in November 1991 to describe its nutrition monitoring activities and provide information to ensure accurate and appropriate statistical applications of data generated by these activities. The meeting, attended by 270 people, covered topics such as the Nationwide Food Consumption Survey, Continuing Survey of Food Intakes by Individuals, Diet and Health Knowledge Survey, Statistical Analysis Considerations, Food Composition Data Resources, Survey Nutrient Data Base, and the Food Intake Analysis System. Researchers from several universities participated in the program to discuss their experiences using HNIS food consumption and food composition data. Opportunity for users to comment about data access and formats was provided, and input from users about their data needs was received.

- o Research on Determinants of Dietary Status and Survey Methods

HNIS maintains an active program in survey methods research through intramural and extramural projects. The following text highlights projects of investigators at colleges and universities that are part of the HNIS program:

- University of North Carolina. Scientists are developing scales to measure the different dimensions of people's knowledge about and attitudes toward healthy eating using data from the 1989 DHKS. The scales will be used to examine the extent to which factors such as age, health status, income, employment, education, race, ethnicity, and family structure contribute to differences in knowledge about and attitudes toward healthy eating. They will also be used with data from the 1989 CSFII to examine the extent to which knowledge about and attitudes toward healthy eating contribute to differences in dietary status.
- Iowa State University. Researchers are determining the correlation structure of data obtained from 3 or more consecutive days' dietary intake data. This will help determine the relative statistical efficiencies of alternative survey designs and provide information on methods of combining data from different surveys.

They are continuing to estimate usual daily intake distributions, which will be used to determine how many people in the U.S. population have intakes for vitamins, minerals, and fiber below recommended levels or above recommended levels for fat and cholesterol.

- University of Maryland. Researchers are investigating how the reporting of dietary intakes by children can be improved in large-scale surveys. They will specify, compare, and evaluate alternative methods.

- Washington State University. Scientists are analyzing NFCS data to identify how households value the nutritional and non-nutritional attributes of foods from which nutrients are obtained. Models being tested are attempts to extend the standard neoclassical model of utility maximization which does not explicitly account for the quality of goods.
- Cornell University. The variation in food consumption by food groups and thus dietary status across different types of households as well as the variation over time among households of a given type is being examined.
- University of California at Berkeley. In two research studies, an economic model approach is being used to determine nutrient shadow prices that are specific to the survey, region of the country, season of the year, and level of urbanization. The effect of differing demographic, health, and economic factors; nutrition program participation; and food group choices of individuals and their households on the nutrient intakes of individuals is also being studied. A consumer behavior model will be used with nutrient shadow prices, food group intakes, and a variety of nondietary variables to derive parameter estimates for a system of demand equations with a separate equation of each nutrient in the data set. Marginal propensities to consume and demand elasticities will be estimated for the nutrients being considered.
- University of Arizona. This study will utilize the individual food intake data from the 1977-78 NFCS as a basis for adjusting the data in the 1987-88 NFCS using, rather than sample weighting, a process of "shrinking" or adjustment toward a structure based upon the relative deviation of the data from the assumed structure. If a variable is systematically and reliably displaced from the structure over all geographical units and age/sex combinations, response bias will be assumed. Structural adjustments will be implemented to minimize the nonresponse bias.
- University of North Carolina. Researchers are using NFCS 1987-88 data to investigate the relationship between eating patterns, defined primarily in terms of source and location of food consumption, and dietary status. Using data from the NFCS 1977-78 and 1987-88, trends in both eating patterns and dietary status are also being examined.
 - o Report on Factors Affecting Diets of Women and Children

A new HNIS administrative report, *Perspectives on the Diets of American Women and Children: Factors Affecting Dietary Status as Measured in the Continuing Survey of Food Intakes by Individuals, 1985*, was prepared for publication.

The report is a summary of the results of eight research studies that analyzed data from the Continuing Survey of Food Intakes by Individuals (CSFII) 1985 under a cooperative agreement with the U.S. Department of Agriculture (USDA). Together these studies provide an overview of the effects of personal, household, demographic, and health-related factors on the diets of American women 19 to 50 years of age and their children age 1 to 5 years. The report should be of interest to professionals in the fields of nutrition, economics, public health, sociology, and related biological and behavioral sciences.

- o Ensuring Food Access: Understanding Food and Nutrition Programs for Limited Income Households

Ways to maximize the potential of USDA-funded food assistance and nutrition education programs to improve the nutritional health and independence of limited-income families with young children were studied in a rural poor county. An indepth analysis of both participating families and program staff revealed that, although the structure and rules of the seven programs studied had an important effect, the ways in which program workers used their discretionary power were critical. If the program worker and family interaction was negative, dependency on programs was more likely than if the interaction was positive or enabling. Implications for program evaluation, staff training, and inter-program relations were identified.

- o Benefits and Risks of Vitamin and Mineral Supplementation

Supplement usage is important not only for its economic impact on the household but also because of potential health problems associated with improper supplementation practices. A survey conducted in seven Western States (consisting of a written survey followed by two phone surveys at 9- and 18-month intervals) established that the use of vitamin and mineral supplements is widespread.

Researchers found that supplement use is correlated significantly with health beliefs. In particular supplementers believe supplements can limit the incidence and/or severity of illnesses ranging from the common cold to cancer, as well as limit or reduce the incidence/severity of stress. Results indicate that economics is not a major factor in the decision to supplement. Those individuals who chose to supplement believe the benefits of supplementation outweigh any cost constraints. The unique data feature of this research was the longitudinal (18 months) examination of supplement practices. Data indicate that 43 percent of the supplementers continued supplementation over the 18-month period, whereas 13 percent of the total sample initiated supplement use and 14 percent of the total sample terminated supplement use.

The major implication of the research is an understanding that supplementation is likely to be a stable rather than fluctuating dietary practice. Hence, the economic implications will be long term. Additionally, for supplementation practices that are inappropriate (mega doses for example) the long-term nature implies increased health risks. These findings strongly support the need for

improved consumer information and more effective methods of nutrition education as it relates to vitamin/mineral supplements.

b. Research on Determinants of Dietary Status and Survey Methods

o A Simplified Somatochart To Describe Human Body Types

Somatotype is a numbering system commonly used to describe the shape and muscular development of the human body, and the somatochart is the graphic representation of different somatotypes. It has largely been necessary to either draw somatocharts by hand or photocopy them from manuals because the existing computer software to generate somatocharts is complex and tedious to use. Now, ARS scientists at the Grand Forks Human Nutrition Research Center in Grand Forks, ND, have devised a new somatocharting method that is based on existing computer software programs and uses a simple rectangular system employing traditional x, y-coordinate axes. This new approach facilitates the general and routine use of a standardized method for characterizing human shape and physique. It should prove highly useful to nutritionists and human biologists who seek to define relationships among body size, shape, development, nutritional status, and physiological and neuropsychological performance.

o Quality of Well-Being of the Rural Southern Elderly: Food, Clothing, Shelter

The overall objective of the 11 State, 1890 Home Economics Regional Research project was to determine the quality of life of the rural elderly by assessing the nutrition, clothing, and housing actual and perceived status parameters and the relationships between and among them. The study included 2,819 elderly who were non-institutionalized, ambulatory, and mentally alert. Analytical, descriptive, demographical, and epidemiological data provided an assessment of the quality of well-being. Status evaluation included biochemical and anthropometric measurement, 24-hour diet recall, subject responses and interviewers' on-site assessments.

As a result of this study, a comprehensive data base on the rural elderly was developed. Data analyses revealed that the quality of well-being determined by economical, social, independence and psychological indicators is significantly impacted by the various indicators of actual and perceived status of clothing, housing, and nutrition. Medical cost is the most serious concern, followed by concern for energy, housing, and food. Results clearly indicate that the rural elderly do not have a satisfying quality of life. Information exchanges are a must for this widely scattered population, and intervention programs and strategies are needed to help older individuals modify their environment to meet basic human needs.

- o Evaluation of Variability of Nutritional Status Indices

Evaluation of long-term changes in the results of nutrient status laboratory tests requires knowledge of both the normal biochemical variation in a healthy individual and the analytical variation. Thus, scientists at the Grand Forks Human Nutrition Research Center in Grand Forks, ND, have determined analytical and biological variabilities for several vitamins, and for general chemical tests normally done in clinical laboratories, for women eating self-selected diets and for others fed a constant diet. Diet was shown to have no significant effect on any of the analyses reported, except for vitamin C. Findings suggest that the more highly variable indices--vitamins and lipids--may not be appropriate for evaluating nutritional status, because more marked changes would have to occur before a disease or change in nutritional status could be properly diagnosed. Furthermore, estimations of both analytical and biological variabilities, as well as knowledge of dietary practices, are essential to the correct interpretation of differences in analyses.

- o Accurate Indicator Found for Long-Term Selenium Intake

Poor nutritional status with regard to the essential trace element selenium has been linked epidemiologically with an increased incidence of cancer and cardiovascular disease in large population studies. However, the relative merits of various indices for monitoring selenium status in individual persons had not previously been fully explored until recently. Scientists at the ARS Vitamin and Mineral Nutrition Laboratory in Beltsville, MD, have examined (1) the concentrations of selenium in serum, whole blood, or toenails, and (2) the amount of selenium excreted in urine as related to the dietary intake by healthy persons residing in a high-selenium area of the United States. Analysis of the data has shown that long-term selenium intake is best reflected by the concentration of selenium in a single specimen of serum or whole blood. This knowledge should be useful to individuals who wish to know their selenium nutrition status.

F. Government Policies and Socioeconomic Factors

- o Feasibility of a Farmers' Market in Kentucky

A farmers' market for an eight-county area in northern Kentucky appears to be feasible according to an AMS study. The market would provide an outlet for the fruits, vegetables, and horticultural crops produced by many small acreage farmers in the area to supplement their declining tobacco income.

- o Fish producers in Kentucky Identified for Local Marketers

An aquaculture directory was prepared that identified people in Kentucky who are in the aquaculture business. It is designed to be used by processors, live haulers, paylakes, and others in the area who want to buy locally produced fish. The project was a cooperative effort between AMS, CSRS, and the Kentucky State University.

- o Procedures To Maintain Quality of Hybrid Striped Bass

A demonstration project identified several procedures for maintaining the quality of hybrid striped bass (rockfish) during distribution. The test followed the product from the point of production in Blacksburg, VA, to the processing plant at Hampton, VA, to retail stores in the Baltimore/Annapolis, MD, area. Cooperating with AMS were ARS, the Maryland Department of Agriculture, Virginia Polytechnic Institute and State University, and Graul's Supermarkets.

- o Methods To Evaluate Production and Marketing Opportunities

The market window and expected value techniques are relatively simple and effective methods of evaluating market potential. They were evaluated by AMS and ACS to show their value to those involved with commercial vegetable production and marketing, as well as to those who are planning to enter the field. Producers need appropriate analytical tools to help them decide whether or not to venture into alternative crops to supplement their farm income.

- o Central Refrigeration Benefits Wholesale Food Centers

Different refrigeration systems in modern food centers (industrial parks for food firms) were evaluated by AMS. Designs included a central system that has a common engine room providing refrigerant to many different firms in the market. The study showed that wholesalers saved operating money and avoided the use of chlorofluorocarbons that could harm the environment by using a central system instead of individual equipment for each firm.

- o Improving Wholesale Food Marketing Facilities

An AMS study of the importance of wholesale produce markets indicated that over one-third of all produce sold in major urban areas moves through such markets. Another study outlined plans for a new wholesale market to serve the Phoenix, AZ, region. An earlier study resulted in a private development company acquiring a site near the Mexican border for a new produce market to accommodate many of the food wholesalers being displaced from the Gas Lamp district in the downtown area of San Diego, CA.

- o Reviews of WIC Nutritional Risk Criteria and Food Packages

Public Law 101-147, enacted November 10, 1989, requires USDA to conduct reviews of the nutritional risk criteria used in the WIC Program and the food packages issued by this program and to submit reports to Congress. To accomplish these reviews and to maximize public involvement in their outcomes, USDA elected to formally solicit public comments through Federal Register notices and to involve the National Advisory Council on Maternal, Infant and Fetal Nutrition in the deliberative process. The Council's role was to develop recommendations in these two program areas. An ad hoc work group, comprised of Council members who volunteered to serve in such a capacity, met June 17-19, 1991, to review draft technical papers on both program review areas developed under cooperative agreements with the Food and Nutrition Service by the University of Arizona and Pennsylvania State University. The final versions of these papers were used as background material when the full Council met on September 11-13, 1991, to deliberate on these two program issues and to prepare recommendations for a final report to Congress. An

interim report on both reviews was sent to Congress in July 1991, and the final report will be submitted in FY 1992.

o Adult Day Care Study

The major objectives of the Adult Day Care Study are to: 1) describe the characteristics of adults and adult daycare centers participating and not participating in Child Care and Adult Food Program (CACFP); 2) compare participating adults and centers to nonparticipating adults and centers; 3) determine CACFP participant dietary intakes and the contribution of USDA meals to meal specific and total dietary intake; and, 4) project program growth. This study examines the caloric and nutrient intake from USDA meals consumed by CACFP participants, including, but not limited to, fat, cholesterol, vitamins A, C, and B6, and calcium. Information on supplements and medications consumed by participants are also being collected. Dietary intakes will be compared to RDA's.

o Study of WIC Participant and Program Characteristics

Public Law 99-500, enacted in 1986, requires FNS to submit a biennial report to Congress on income and nutritional risk characteristics of participants. To satisfy this requirement, FNS developed and implemented a system of gathering, analyzing, and publishing WIC Program information. The information includes periodic descriptions of the characteristics of State and local agencies which operate the program as well as the characteristics of individuals and families participating in the program. Data for the 1990 report was gathered from a national sample of participant records. A part of the groundwork for future data collections, a Minimum Data Set has been agreed upon and technically specified for use in 1992 data collection. States will generally submit a census of participants for approximately 20 data elements directly generated from ongoing management information systems serving the WIC Program.

o WIC Child Impact Study Field Test

The purpose of this study is twofold: (1) to simultaneously field test two research designs which are intended to examine the impact of the WIC Program on the health and development of infants and children; and (2) to collect preliminary data on the effects of WIC on children. The study also includes field testing the data collection measures and procedures proposed in the two research designs. The final report was issued in October 1991. FNS selected a research design which is a variant of the two designs tested. Plans are underway to conduct a full-scale study.

o WIC - 1988 National Maternal and Infant Health Survey

FNS is one of several Federal agencies participating in a health data collection effort by the National Center for Health Statistics. The major areas of investigation include: low birthweight and infant mortality; barriers to, and facilitators of, prenatal care; the effects of substance use on pregnancy outcome; and use and evaluation of public programs, such as WIC, by mothers and infants. The inclusion of WIC questions in the survey is expected to provide data on WIC services and outcomes in the context of other health and medical information covering most of the nutritional risk conditions for high-priority WIC eligibility during pregnancy. Information from the mothers' survey was released to FNS in June 1991. Health care

provider survey data will be released in early FY 1992. Analysis of the mothers' data has been initiated.

- o CDC-FNS Cooperative Project on Smoking Cessation In Pregnancy

A cooperative agreement with the Centers for Disease Control (CDC) extended its Smoking Cessation In Pregnancy (SCIP) project to include coverage of WIC sites. Pilot projects for intervening in smoking behavior in WIC and prenatal care settings operated in Colorado, Missouri, and Maryland. The major objectives of this project were to: develop, field test, and evaluate a package of smoking interventions for use with WIC participants which is compatible with both prenatal clinic and WIC program settings; and develop a practitioner's guide for adapting and implementing prenatal smoking cessation efforts for WIC participants in non-study sites. Although the study has been completed, the evaluation will continue for quite some time. FNS plans to design, print, and distribute 4,000 copies of the SCIP guide for WIC local agency staff in FY 1992.

- o WIC Dynamics Study

The purpose of this study is to determine the impact of infant formula rebates and other changes on the WIC Program. The research objectives are to: 1) determine the effects of a period of rapid growth and change, generated by the implementation of infant formula rebates, on local WIC agencies' service delivery; 2) determine the impact of increased participation on the program's integration and coordination with local health care delivery systems; 3) assess the nutrition services provided to WIC participants; and 4) assess the impact of computer-assisted nutrition services on local agency administrative efficiency. The projected completion date is the fourth quarter of FY 1993.

- o WIC Modeling and Analytic Project

This 3-year project will extend into 1993. The major objectives are to: 1) analyze health and nutrition characteristics of participants and eligibles (i.e., health status, nutritional risk, dietary intake, eligibility and breastfeeding); 2) analyze effects on WIC participation on infant mortality, health status, child development and cost-benefit ratios; 3) provide exploratory and conceptual analyses on the effect of WIC infant formula rebates on formula prices, market shares for WIC foods and the portion of the income-eligible population at nutritional risk; 4) model program dynamics on eligibility and provide State-specific eligibility estimates; and 5) provide capability for ad hoc analyses at FNS' request.

- o Dietary Assessment Methodology

The Food and Nutrition Service (FNS) completed work through a cooperative agreement with the Harvard School of Public Health (HSPH) in fiscal year 1991 on the development of two dietary screening instruments for potential use in the WIC Program. The agreement included modification and expansion of a prenatal dietary assessment tool previously developed under a Special Project of Regional and National Significance (SPRANS) Grant funded by the U.S. Department of Health and Human Services (DHHS). Additional research expanded its screening capability to include all women, postpartum (lactating and non-lactating) as well as pregnant women, and to allow for development of a comparable tool for screening children 1-5 years of age. Field observations

of the instruments in WIC clinics were conducted to assess appropriateness of the food listings and ease of participant self-administration. A method of manual scoring of instruments was derived in addition to further development of the computer analysis program.

- Evaluation of the Alabama Pure Cash-out Demonstration, the San Diego Cash-out Demonstration, and the Washington State Family Independence Program

The major focus of these three evaluations is on the effects of issuing food benefits in the form of cash on recipient household expenditures, food expenditures, food use, and nutritional availability.

- Child Nutrition Program Operations: On-site Meal Observation Substudy

This study examined the food and nutrient composition of NSLP and SBP meals at three levels: (1) as offered by participating schools, (2) as selected by participating students, and (3) as actually consumed by participating students. At each level, the total nutrient content of an average meal was compared to the Recommended Dietary Allowances for essential nutrients. The fat, cholesterol, and sodium content of meals was also examined. Data collection occurred in a total of 60 schools in 20 school districts.

- Menu Modification Demonstrations

FNS awarded 3-year grants to five school food authorities to conduct menu modification demonstration projects. These sites will demonstrate local level efforts to improve the nutrient content of meals served, particularly in the areas of reducing fat and sodium. During the 1990-91 and 1991-92 school years, grantees will implement recipe, food specification, and food preparation modifications to meet their individual fat and sodium content goals. An independent evaluation is being conducted, and data collection includes nutrient analysis of menus, plate waste measures, and 24-hour dietary recalls. A report is expected in early 1993.

- Dietary Assessment of School Nutrition Programs

The primary objectives of this study are to determine the nutrient content of meals offered to students, to assess the impact of USDA meals of student meal specific and total dietary intake and compare the study's dietary intake findings to previous findings. Secondary objectives include determining which meal preparation factors significantly affect the nutrient content of USDA meals, identifying the USDA and non-USDA foods selected by students, and measuring the extent of plate waste under the "offer vs. serve" (OVS) option and non-OVS systems. Generally, the study examines the nutrient composition of the meals offered to students, the types of foods selected by students, and the nutritional value of the foods consumed by students. Data collection for this study occurred during the spring of 1992. Final results are expected by winter 1992-93.

- The Savings in Medicaid Costs for Newborns and Their Mothers from Prenatal Participation in the WIC Program

The objective of this study was to assess the savings in Medicaid costs for women and their newborns during the first 60 days after birth as a result of their prenatal participation in the WIC Program. Researchers examined

Medicaid costs, prenatal WIC participation and birth records in Florida, Minnesota, North Carolina, South Carolina, and Texas. The research indicated average reductions in Medicaid costs for mothers and their newborns from birth to 60 days after delivery, ranging from \$277 in Minnesota to \$598 in North Carolina. Benefit-cost ratios were positive for all five States, ranging from \$1.77 in Florida to \$3.13 in North Carolina. The study also documents greater use of prenatal care by WIC participants and that prenatal WIC participation was associated with improved birth outcomes, including higher birthweights and a lower incidence of preterm births. This study has been completed and a report was submitted to Congress on October 1, 1990.

o New Estimates of a Cash-Only Food Stamp Program

Food Stamp Program (FSP) benefits are paid as coupons principally because of the assumption that low-income households will spend more on food if they receive their benefits as food stamps as opposed to receiving them in cash. Previous studies have appeared to verify this assumption. These studies found food stamps have a much larger affect on food expenditures than income. These studies found that after cashing-out the FSP, food expenditures would be only 20 to 25 percent of their level with food stamps. Using less restrictive estimating methods and a theoretically consistent model, this ERS paper estimates that a cash-only FSP would have food expenditures that are 90 percent of their level with food stamps. This new result implies that the consequence of cashing-out the FSP is not as great as previously imagined. A cash-only FSP also would lower the administrative costs of operating the FSP and eliminate the fraudulent and black-market trading of food stamps.

G. Food and Nutrition Information and Education Research

1. Establishing Dietary Guidance Policy (HNIS)

o Assessment of Nutrition Education Needs of Pregnant Teenagers

A nutrition education research study was initiated in 1991 to assess nutrition education needs of pregnant teenagers through a workshop with professionals who serve this clientele and through a series of focus groups with pregnant teens. Special attention will be given to identifying effective formats and media for delivering nutrition information important to this audience. Based on needs assessment results, prototype information materials in one or more media (print, audio, or videotape) will be developed and tested with pregnant teens for appeal, comprehension, and usefulness of the information provided.

o Evaluation of Dietary Guidelines for Americans Bulletin

A nutrition education research study was conducted to determine usability and understanding of the nutrition information presented in the bulletin, Dietary Guidelines for Americans. In the second portion of this study, completed in 1991, indepth interviews were conducted with 45 male participants--one group (30) who had children at home and another group (15) whose children had grown and left home ("empty nest"). Men's responses to the bulletin were very similar to those obtained previously for women in the same life stage, with some minor differences. Men tended to quantify their responses more often, made a firmer link between diet and health, and related weight to physical performance rather than appearance. Like the women, the men had difficulty with the terms "moderate," "adequate," and "avoid." Many men thought the bulletin could be improved if it contained more information about food, more

numerical information, and stronger language. Overall, the data support the changes made for the third edition of the Dietary Guidelines, which was released after the study interviews had been completed.

- o The Dietary Change Research Model

Research using the Dietary Change Research Model has continued. The mathematical model measures the change required in food consumption patterns of Americans to meet nutritional recommendations. The changes needed in diets of adult women to meet the 1989 Recommended Dietary Allowances and other recommendations from the National Research Council were assessed. Challenges to and strategies for implementing these nutritional recommendations were explored. An article that describes the model and demonstrates its uses has been submitted for publication in a professional journal.

- o USDA's Dietary Analysis Program

USDA's Dietary Analysis Program was developed by HNIS in cooperation with the Extension Service for use by consumers to assess the nutrient content of their diet. The software is being made available on the HNIS Nutrient Databank Bulletin Board as well as through the National Technical Information Service (NTIS). Conversion of the software to Apple computer format is being completed and prepared for distribution through NTIS.

- o Cost of Food

The cost of food at home in food plans at four cost levels--thrifty, low-cost, moderate-cost, and liberal--was estimated and released monthly in press releases and other formats. The cost of food in the thrifty food plan for the 4-person household, which is used by the Department in setting benefits for the Food Stamp Program, increased 5.2 percent between June 1990 and June 1991.

2. Food and Nutrition Materials and Methods (HNIS)

- o Revision of "Dietary Guidelines and Your Diet" Publications

A project to revise a set of seven bulletins on using the Dietary Guidelines, HG 232 1-7, "Dietary Guidelines and Your Diet," and develop one new overview bulletin was initiated in 1991. Revisions include updating nutrient data and scientific information and incorporating information specifically related to the 3rd edition of the Dietary Guidelines, which was released in 1990. Revisions also consider previous nutrition education research studies to evaluate consumers' understanding and use of the bulletin series. Design of the series is being revised, and formative evaluation of three prototypes is being conducted with focus groups of adults with at least median income and high school education. Based on results of the focus groups, all eight bulletins will be prepared for printing and distribution as a set. In the past, these bulletins have been widely used by nutrition educators and incorporated into their programs in a number of ways.

- o Dietary Guidelines Factsheets for Healthy Older Americans

A manuscript for a series of six brief factsheets for healthy older adults on using the Dietary Guidelines for Americans has been developed and approved jointly with the National Institute on Aging (NIA) and is awaiting design for the publication. It is anticipated the series will be available in spring 1992 as a packet of factsheet-style leaflets in an attractive folder, and

distributed through the National Institute on Aging, Extension Service, HNIS, and other appropriate agencies.

- o Dietary Guidelines Booklet for Adults With Low-Literacy Skills

A manuscript for "Making Food Choices," a brief booklet on using the Dietary Guidelines for adults with low-literacy skills, has been developed based on cooperative research previously conducted adapting materials for this audience. The manuscript is awaiting final departmental approval, to be followed by design and printing.

H. Food Marketing and Demand

1. Studies on Food Supplies, Prices, Expenditures, Marketing Costs, Safety, Technology, and Consumer Demand

ERS's FoodReview: Focus on the Food System (FR 1991 Yearbook issue, Volume 14, Issue 3, July-September 1991) looked at what Americans had available to eat, who supplied it, who prepared or processed it, where we purchased it, who paid for it, and how nutritious it was. The yearbook issue discusses trends in food consumption and food price changes such as Americans are not necessarily successful in changing their diet to lower fat intake; instead, they seem to be merely substituting one fat source for another. Also included is information on the growing spread between farm and retail prices, that Americans are eating out more than ever, and how food assistance programs are helping to feed the less fortunate.

- o U.S. Food Supply Trends

ERS updated the U.S. Food Supply data series in FY-91 in Food Consumption, Prices, and Expenditures, 1968-89 (FCPE), Statistical Bulletin 825, May 1991. FCPE is an annual publication. The 1991 Yearbook issue of the FoodReview (Volume 14, Issue 3, ERS, USDA, July-September 1991) includes the following two articles: "Food Consumption, 1970-90" (by Judith Jones Putnam, ERS, USDA, pp. 2-12, 18) and "Nutrient Content of the U.S. Food Supply" (by Nancy Raper, HNIS, USDA, pp. 13-17).

- o Estimates of Per Capita Food Supplies of Bell Peppers, Cabbage, Cucumbers, Snap Beans, Eggplant, Garlic, Artichokes, Cantaloupe, and Watermelon Are Reinstated

In 1981, USDA discontinued reporting of national acreage, production, and value for many fresh and processing vegetables. Since that time, per capita use estimates for these commodities have also been discontinued because of the lack of national production statistics. Because of the importance of some of these commodities and the availability of production data from some of the major States, ERS has been able to estimate per capita use for the missing fresh market commodities. ERS plans to publish a report detailing supply and use estimates for each of the commodities for which per capita use is estimated. The report will include estimates and methodology for the items listed in the heading.

- o Growing Demand for Low-Fat Foods and Food Industry Response

Americans are increasingly aware of the links between diet and health and many are taking steps to reduce their fat intake. In a recent article published in Agricultural Outlook, ERS economists discuss the growing demand for lower fat foods and how the food industry has responded to this marketing opportunity. Some food manufacturers have been able to lower the fat content of their products through reformulations using nonfat ingredients or by baking rather than frying their products. The authors describe how other manufacturers have taken advantage of new protein- or carbohydrate-based fat replacers to cut the fat in their salad dressings, frozen desserts, and baked goods. The authors also discuss how consumers are getting help with dietary decisions from USDA's Food Safety and Inspection Service and the U.S. Food and Drug Administration as these agencies develop nutrition labeling regulations. With labels carrying greater and more useful nutrition information, competitive pressures to offer truly lower fat products may have manufacturers scrambling to reduce the fat in their products through reformulations or the use of fat substitutes. Changes in standards of identity to allow lower fat levels in traditionally named foods may also expand the offerings of reduced-fat products. For further information, see "Lower Fat Foods: New Technology, Increased Demand" (by R.M. Morrison and J. Putnam) in Agricultural Outlook (ERS, USDA, AO-179, October 1991, pp. 28-32).

- o Changes in Demand Lead to Leaner Hogs

Until the 1950's, pork was Americans' meat of choice. By the mid-1950's, beef surpassed pork in per capita consumption; by the mid-1980's, poultry overtook pork, as health implications of fat intake were increasingly identified. To keep up with the competition, pork producers strived to maintain market share mainly by lowering costs of production and developing a leaner product. Attention to qualities such as carcass length and backfat thickness led researchers and breeders literally to transform the hog into an animal with less fat and improved feed conversions. From 1970 to 1990, the amount of fat per 100 pounds of carcass has been cut by more than half. For further information, see "Demand, Technology Shape U.S. Hog Industry" (by Phil Spinelli) in Agricultural Outlook (ERS, USDA, AO-180, November 1991).

- o Revised Conversion Factors for Pork Consumption

ERS has revised two types of pork consumption measures--the retail and the boneless, trimmed equivalent consumption series--to better reflect the amount available for consumption. The revised series show pronounced marketing and consumption changes: pork is now leaner, being trimmed more closely, and being sold with much less bone and with little or no skin. The revised retail series shows that Americans, on average, are purchasing less pork on a retail-equivalent basis than previously estimated. But according to the revised boneless series, the pork purchased since 1971 contains more total meat (retail equivalent minus the bone in retail cuts), more lean meat, and less fat, on average, than previously estimated. For further information, see "Revised Conversion Factors for Pork Consumption" (by Lawrence Duewer) in Food Review (ERS, USDA, Volume 14, Issue 3, July-September 1991).

- o Vegetables Gain Popularity

A record production of fresh and processing vegetables in 1990, following above-trend output throughout the 1980's, illustrates the gathering strength of the industry and the continuing increase in consumer demand. Many niche

markets will expand. Although the market for specialty vegetables and herbs is small, it is expanding more rapidly than the rest of the industry. Supplies, including imports, of specialty vegetables in 1990 were up 12-15 percent from a year earlier. The market for specialties will continue to grow during the 1990's as the appeal of unusual produce grows and the population of various ethnic groups increases. Prices for some of these high-cost vegetables may come down as the number of growers increases, and as growers and retailers develop new production and marketing technologies. In contrast, the market for organic produce has grown dramatically during the past decade, but there are significant obstacles that could slow growth during the 1990's. Consumers using high-volume retail outlets may be unwilling to pay the substantial price premiums associated with organic produce. The outcome of the public debate on pesticide use in agriculture may have more influence on vegetable production in the 1990's than any other issue. For further information, see "Vegetables Gain Popularity" (by Catherine Greene) in Agricultural Outlook (ERS, USDA, AO-171, January-February 1991).

o U.S. Flour Milling on the Rise

American millers are grinding increasing amounts of wheat into flour to meet consumer demand. Flour consumption in the United States has grown almost steadily since 1970, with per capita use rising by 24 pounds, or an average of over 1 pound each year. Growing interest in healthy eating and convenience has set the pace for this growth. Consumers have been boosting their consumption of fiber, bran, and whole grains. At the same time, they are buying more highly processed convenience foods--like sandwiches, pizzas, and tortillas--which often contain large amounts of flour. This situation reflects a turnaround in flour's fortunes. Per capita flour use is at its highest level since the early 1950's. This trend is in sharp contrast to the declining flour consumption levels of the 1960's and early 1970's. It is also one of the first reversals in flour consumption in the developed world.

. o U.S. Baking Industry Responds to Consumers

To meet the demand for greater food variety in the late 1970's and 1980's, manufacturers introduced many new bakery products, launching 1,155 new items in 1989 alone. Partly because of these efforts, items once considered strictly specialties--such as bagels and pita bread--have gained in popularity. Meanwhile, supermarkets accentuate sales from in-store bakeries, while retail bakers emphasize specialty goods and cookies. Restaurants cater to consumer demand for quick, inexpensive sandwiches. All industry segments have tapped into the trend of healthful eating, such as consumers' interest in whole wheat breads and oat bran muffins.

o Advertising and Demand for Cheese and Milk

ERS conducted research on the effects of advertising and promotion on the demand for cheese and milk. During the 68-month period between September 1984 and June 1990, increased generic advertising by the National Dairy Promotion and Research Board and regional organizations, advertising valued at \$224.3 million, increased national at-home consumption of natural cheese by 23 million pounds and processed by 229 million pounds. In addition, both the national and regional boards were responsible for approximately \$38.8 million in additional fluid milk advertising expenditures in 12 regions of the United States, which include 40 percent of the total U.S. population. These expenditures resulted in an estimated 5.98-billion-pound (4.4 percent) increase in the 12 regions' fluid milk sales.

- o Estimating the Portion of Food Eaten by Americans That Is Prepared at Home Versus Away From Home

Knowledge of the kinds and quantities of food eaten in the at-home and away-from-home markets is critical for accurate assessments of the impacts of Government policies and programs, including nutritional efforts. ERS has begun a project to estimate the amount eaten by Americans at home and away from home for different foods. ERS is using the individual intake portion of the 1987-88 NFCS to calculate what portions of 116 different foods or food groups are prepared at home versus prepared outside the home. These calculations will be compared with a similar analysis of the 1977-78 NFCS data.

- o Purchase of Data on Away-From-Home Eating

For a variety of reasons including higher incomes and more working women, the share of total food expenditures spent for food eaten away from home has been increasing. Expenditures for food away from home now accounts for 46 percent of total food expenditures. Realizing the importance of the away-from-home sector, ERS has purchased historical data on food and beverage purchases from commercial food establishments from a private data collecting company. The data includes information on type of eating establishment, meal/snack occasion, whether the eating place was part of a hotel/motel or retail store, the amount paid for the meal, and the foods and beverages consumed. A variety of sociodemographic characteristics about the households making the purchases are included in the data set. This data will be used to conduct research on trends in the away-from-home market and on the response of away-from-home food spending to changes in prices, income, and other sociodemographic factors, as well as Government policies and programs.

- o Spending on Eating Out Continues To Rise

Food expenditures in the United States have risen almost every year since the end of the Great Depression. However, household income has risen even faster (chiefly because of the increasing number of families with more than one wage earner), so food spending as a percentage of income has declined. Higher income households spend more money on food, but use a smaller share of income, than lower income households. Measures of food expenditures and income vary according to how income is measured, what expenses are counted, and who is paying for the food. The percentage of income can be an indicator of economic conditions of a general economy. In an affluent society like the United States, people spend less of their income on food and have more to spend on other things. Food spending has risen over the years partly because more food is eaten out (in restaurants, for example) where prices are higher. Rising incomes are chiefly responsible for increased spending for food away from home. A major part of the increase in income per household is due to a rise in the number of households with more than one wage earner. Such households generally have more money, and eat out more often, than single-earner households. U.S. Food Spending and Income: Changes Through the Years (by Alden Manchester, ERS, USDA, AIB-618, January 1991) explores relationships that have contributed to increases in U.S. food spending over the years and the decline in food spending's share of income.

- o The Food Industry

Retail sales of the U.S. food marketing system fell flat in 1990 and declined in 1991, after adjustments for price increases, due to the recession.

Nevertheless, food manufacturers and retailers showed continued increases in profitability from operations (excluding interest expense), reflecting wage and producer price stability and streamlining of operations. Food manufacturing and retailing continue to be among the most highly leveraged U.S. industries because of large leveraged buyouts in the late 1980's. Mergers and leveraged buyout transactions fell sharply in 1990 and 1991 from the phenomenal levels of recent years in both volume and value. Competition among larger and fewer firms for a share of the food dollar and limited shelf space was reflected in record new product introductions, consumer advertising expenditures, and retail promotions, including payments to retailers to stock new products. But even in some highly concentrated industries, price discounts appeared prevalent. The system's performance continued its spectacular strength of recent years as reflected in increased globalization, higher levels of new plant and equipment expenditures, and outstanding performance for common stock owners. The latest information is published in the Food Marketing Review, 1991 (ERS, USDA, Agricultural Economic Report No. 657, January 1992).

- o The Farm-to-Retail Price Spread

Consumers, farmers, and legislators want to know what causes food prices to change. They are also interested in the difference between what farmers get for the food they sell and how much consumers pay for that food, commonly referred to as the farm-to-retail price spread. To answer these concerns, Congress has directed the USDA to measure price spreads for food originating on farms. An ERS report presents USDA's findings for 1990, including answers to the following questions: How much did food prices rise in 1990? Why? How much of the retail food price does the farm value represent? How did farm-to-retail price spreads change in 1990, both for a market basket of food and for such food groups as meat and dairy products? How have recent developments affected food industry costs, profit margins, and productivity? Finally, how much did Americans spend for farm-produced food, and how were these dollars divided among costs of producing and marketing food? For further analysis, see Food Cost Review, 1990.

- o Food Prices

ERS forecasts the Consumer Price Index for all food, food away from home, and food at home, including 16 subaggregates of food at home. An annual forecast is released in late November each year at the National Agricultural Outlook Conference. Updates appear in Agricultural Outlook (ERS, USDA, monthly) and are available from ERS economist Ralph Parlett (202-219-0870).

- o Meat Price Spreads Are Not Proof of Price Gouging

When meat prices fall at the feedlot but not at the grocery store, the spread between wholesale and retail prices widens--as has been the case for some time. This growing spread usually means that retail price changes lag behind farm price changes, not that there is excessive concentration in the meat industry.

- o Cattle and Forages Can Play a Vital Role in Sustainable Agriculture

Rotating crop plantings and forage cover will aid in reducing soil erosion and water contamination, while helping to hold down the need for heavier fertilizer and pesticide use in grain production. With more emphasis on

forage, cattle will play an important role in maintaining an economically and environmentally sound agricultural production system.

- o Major Postwar Changes in Food Marketing

Changes in food marketing have been pervasive since World War II. The makeup of the population, lifestyles, incomes, and attitudes on food safety, health, and convenience have drastically changed. These changes mean that farmers and marketers of food products have had to alter the way they market food. The manufacturers, wholesalers, retailers, and food service firms that make up the food marketing system have made vigorous efforts to meet changing consumer wants and needs. Marketing the Nation's food and fiber is a huge undertaking. It embodies a variety of functions, employs 17 percent of the work force, and contributes 16 percent of the gross national product. For food alone, marketing cost \$416 billion in 1990. Markets now offer a wide choice of products, a variety of distribution systems, and many built-in services, such as precooked meats or microwave meals. Much of this diversity has resulted from the keen awareness of food manufacturers, wholesalers, retailers, and food service firms that the market is consumer-driven and by the competitive efforts of marketing firms to adapt. Consumer spending in the marketplace provides constant feedback on how closely marketers have met perceived wants. Finding out what consumers want and how they feel about various product characteristics has become big business. Management practices now involve studying changes in consumer lifestyles and preferences, and adjusting businesses to capitalize on those changes. For more detailed analysis, see The Food Marketing Revolution, 1950-90, by Alden C. Manchester, ERS, USDA, AIB-627, August 1991.

- o Food Spending by Demographic Groups, 1980-88

The report How Did Household Characteristics Affect Food Spending in 1980-88? looks at trends in U.S. per capita consumption of total food, food at home, and food away from home using the latest data from annual surveys of urban household food spending for 1980 to 1988. Actual household spending was adjusted to 1988 food price levels to focus on consumption changes. Total food spending rose sharply for one-person households but declined steeply for households with six or more persons. Households headed by people age 65 and over spent most on food at home and the least on food away from home. Identifying emerging consumption trends can help the Nation's farmers, food processors, and marketers meet the needs of a changing population. At the same time, recognizing current spending trends for various population segments helps identify groups whose consumption of some commodities is higher or lower than others. Facts showing extraordinarily high- or low-commodity consumption can help pinpoint subgroups at potential nutritional or dietary risk. The U.S. Department of Labor's Bureau of Labor Statistics has conducted annual consumer expenditure surveys (CES) since 1980. That series provides a rich source of information on the spending patterns of American households. The most recent data released are for 1988. This report uses information from these surveys to examine trends in inflation-adjusted total, at-home, and away-from-home food spending for various sizes and kinds of households, income groups, regions, and races.

- o Food Spending by Female-Headed Households

Since female-headed households constitute a growing proportion of the total population, particularly of the population receiving food assistance, ERS has conducted research to determine why female-headed households spend less for

food, on a per person basis, than similar two-parent households. Although the presence of a male head was found to influence food expenditures, this effect was smaller than the effect on food expenditures due to household income and education level of the female head. Low-income and low-education levels are two characteristics widely associated with female-headed households. Analysis of expenditure patterns among 15 food categories reveals that the factors that influence a household's decision to purchase a particular food category differ from those that influence the decision of how much to spend on that food category. For this reason, the study recommends using a two-step decision model, rather than the traditional tobit model. Results of this study are in the process of being published in an ERS technical bulletin by Elizabeth Frazao.

- o Controversy Over Livestock Growth Hormones

Biotechnological advances in growth hormones are out of the lab and in the process of being approved for commercial use. Some say they will revitalize the livestock industry with better products and lower costs. Others are concerned about overproduction, food safety, animal welfare, and the future of small farms. For further analysis, see "Controversy Over Livestock Growth Hormones Continues" (by Don P. Blayney, Richard F. Fallert, and Shayle D. Shagam) in the FoodReview (ERS, USDA, January-March 1992).

- o Issues Surrounding Growth Hormone Adoption

Animal growth hormones could improve efficiency of meat and dairy production. But, their effects may only reinforce current trends, such as higher productivity, in the livestock and dairy industries. The principal beneficiaries of growth hormones could be consumers, through lower prices for meat and milk. While there is much concern about effects of growth hormone adoption on small farms, there is no clear evidence that growth hormone adoption would favor large farms over small farms. Because growth hormones are one of the first potential commercial products outside the drug industry developed with biotechnology, they have received more scrutiny and raised more public concern than most other new technologies. Adoption of new agricultural technology often presents society with tradeoffs, and raises questions about how new technology affects the economic welfare of consumers and farmers. Growth hormones have been approved for trial use in the production of meat and milk. But, final Government approval depends on proof that the hormones are actually efficient, productive, and commercially viable. If approved for commercial use, animal growth hormones could significantly increase U.S. production of meat and milk, while reducing associated production costs. The use of growth hormones could also lead to fewer and larger dairy and livestock farms, yet there is not clear evidence that this is the case. However, lower production costs for these basic commodities would translate into lower retail prices for consumers. For further analysis, see Implications of New Technology for the Livestock Sector: Animal Growth Hormones (by McClelland, Kucher, and Reilly, AIB-626, ERS, USDA, September 1991).

- o Consumer Perceptions of Oyster Safety and Implications for Regulatory Programs

An ERS cooperative agreement found that market surveys can identify important determinants of consumer food safety perceptions. In a telephone survey of adults in the Mid-Atlantic and Southeastern States, authors Lin, Milon, and Babb found that individuals reevaluate their perceptions of food safety based on factual information about the product risk, that the perceived

controllability of the health risk is important, that demographic variables influence the safety ratings, and that the characteristics of the risk are important. The importance of the components of the health risk from oysters suggests that targeting an inspection and consumer education program on specific aspects of the risk may be helpful. For example, an inspection program that lessened the likelihood of frequent, relatively minor illnesses may have more impact on safety perceptions than a program that reduced rare and severe illnesses alone. For additional information see: C.T. Jordan Lin, J. Walter Milon, and Emerson Babb, "Determinants of Subjective Food Safety Perceptions: A Case Study of Oysters in the Southeast," Journal of Agribusiness, Spring 1991.

- Consumers Are Willing To Pay for Measures To Increase Poultry Safety

An ERS cooperative agreement explored consumer attitudes toward food safety and willingness to accept selected bacterial control measures for fresh chicken in a telephone survey in four cities. Over 30 percent of survey respondents expressed serious concern towards food safety problems, 63 percent expressed moderate concern, and 6.3 percent expressed slight concern. When asked to name foods they no longer consumed, or consumed less frequently due to concern over the food's safety, 8 percent of respondents identified chicken. Four percent believed they had suffered food poisoning from chicken. Nearly 85 percent of respondents were willing to buy safe chicken treated by chemicals or irradiation. Respondents were indifferent with regard to the potential risk of chemical baths and irradiation. Consumers were willing to pay about 16 cents more, per pound, for chicken which had been carefully inspected for bacterial contamination. If bacteria had been destroyed by chemical wash or by irradiation, consumers would pay about 15 and 12 cents more on average, respectively. About 80 percent were willing to change food preparation techniques and spend up to 20 minutes more preparation time to avoid cross-contamination with other foods. For additional information see: S.D. Moss, R.L. Degner, and J.A. Zellner, "Consumer Attitudes Toward Food Safety and Willingness to Accept Selected Bacterial Control Measures for Fresh Chicken," Florida Agricultural Market Research Center tech. rept. 91-1, University of Florida-Gainesville, July 1991.

- Nutrition Labeling

ERS has published informative articles on the upcoming nutrition labeling efforts by USDA and FDA in Agricultural Outlook (ERS, USDA, July 1991) and in FoodReview (ERS, USDA, January-March 1992). In addition, ERS has worked closely with FSIS in the regulatory impact analysis of USDA's proposed regulations for nutrition labeling.

- ERS's FoodReview: The Food System and the Environment

Volume 14, Issue 2, April-June 1991 explores some of the economic-environmental relationships involved in producing, processing, and transporting food. Related papers in this volume are as follows.

Pesticides: How Safe and How Much? Using pesticides is cost effective--they return more to farm income than they cost. But consumers question pesticides' safety in relation to food, water quality, farm workers, and wildlife. Changes could be costly. (By John R. Schaub, Chief, Agricultural Inputs and Production Systems Branch, Resources and Technology Division, ERS.)

The Delaney Clause: New Interpretations. EPA's new policy on pesticide registrations shifts from zero tolerance of carcinogenic pesticides required by FDA's Delaney Clause to negligible risk. The issues surrounding the change are complex and still being studied. (By Philip Szmedra and Walter Ferguson, Resources and Technology Division, ERS.)

Environmental Concern Sparks Renewed Interest in IPM. Integrated Pest Management is a pesticide-reducing farming system that also saves money. Total benefits to farmers in 15 States that use it exceed \$500 million. The system becomes more important as State and Federal regulations on pesticide use tighten. (By Catherine Greene, Commodity Economics Division, ERS.)

Agriculture and Water Quality Conflicts. Losses from water pollution cost billions of dollars, not just to agriculture but also to recreation, commercial fishing, and municipal water sources. Public policies to protect water quality stress the importance of joint, cooperative efforts. (By Steve Crutchfield, Resource and Technology Division, ERS.)

Ethanol in Agriculture and the Environment. The Clean Air Act and the Persian Gulf War refocused public attention on ethanol. However, current production is unlikely to contribute significantly to U.S. energy supplies without government subsidies. Ethanol's limitations can be resolved but it will take some restructure. (By James Hrubovcak, Resources and Technology Division, ERS.)

Managing Solid By-products of Industrial Food Processing. Currently, less than 3 percent of food processing by-products are landfilled. Instead, many food firms turn them into useful products such as animal feeds, other human foods and additives, and fuel. Many are high-value products. (By Luanne Lohr, Assistant Professor, Department of Agricultural Economics, Michigan State University.)

Refrigerated Transportation: CFC's and the Environment. The refrigerated trucking industry is searching for safe, reliable chemicals to replace chlorofluorocarbons that are scheduled to be banned by the U.S. Government by the end of the decade. Restructuring the industry is expensive and will increase the cost of hauling perishable products. (By Dieter Fischer, Appropriate Technology International, Washington, D.C.)

Food Packaging. Packing in the United States is a \$70 billion industry. About 70 percent is used by the food and beverage industry and the throwaways are an environmental issue. (By Robert Testin and Peter Vergano, associate professors of Packaging Science, Department of Food Science, Clemson University.)

III. NUTRITION EDUCATION AND INFORMATION

The Human Nutrition Information Service coordinates Federal dietary guidance policy, develops research-based dietary guidance materials for the general public, and reports results from its research in food composition, food consumption, and nutrition education to professionals.

The Cooperative Extension Service (CES) is a public-funded, nonformal, educational system that links the education and research resources and activities of the U.S. Department of Agriculture, 74 land-grant universities (located in all 50 States, 6 territories, and the District of Columbia) and 3,150 county administrative units.

The CES is a dynamic, ever-changing organization pledged to meeting the country's needs for research, knowledge, and educational programs that will enable people to make practical decisions. Its mission is to help people improve their lives through an educational process that uses scientific knowledge focused on issues and needs.

A. USDA's Responsibility To Ensure That the Federal Government "Speaks" With One Voice" When Issuing Dietary Guidance

1. Promotion of the 1990 Edition of the Dietary Guidelines

o Outreach Activities

HNIS' ongoing nutrition education campaign called "Eating Right...the Dietary Guidelines Way" has successfully completed a third promotion to increase awareness of the Dietary Guidelines and to help people put them into action. Results of USDA's Nationwide Food Consumption Surveys and Diet and Health Knowledge Survey as they relate to the 1990 Edition of the Dietary Guidelines for Americans were highlighted in a press kit sent to over 3,000 media and approximately 1,000 nutrition/health contacts in the professional community. A slide catalog--including slides from the 1990 Edition of the Guidelines and teaching slides on how to put the Guidelines into action--was also developed. This catalog facilitates promotion of the Guidelines in presentations made by the professional community.

o Cooperative Project with the Food Marketing Institute

A condensed version of the 1990 edition of the Dietary Guidelines for Americans entitled "Eating Right with the Dietary Guidelines" was developed by the Food Marketing Institute (FMI) in cooperation with USDA and DHHS. Twenty thousand copies each of a colored 8-panel brochure and a black and white reproducible are being distributed to nutrition professionals. Through supermarkets throughout the Nation, the Food Marketing Institute will distribute the brochure to consumers.

o Dietary Guidelines Teacher's Guide for Health Educators

Development and design of a Dietary Guidelines teacher's guide for secondary school health education teachers were completed. The guide is currently undergoing final departmental approval. A workshop describing the guide's development and demonstrating sample activities was conducted at the Annual Conference of the American Alliance of Health, Physical Education, Recreation, and Dance. Plans were initiated for joint distribution of the guide by HNIS and the Association for the Advancement of Health Education.

2. Uniformity Within USDA

The Dietary Guidance Working Group of the Subcommittee for Human Nutrition, initiated in 1986, continues to review all USDA publications and materials that contain dietary guidance information to help ensure (1) that they accurately reflect USDA's food and nutrition policy as presented in the Dietary Guidelines for Americans and in the Secretary's Statement of USDA's Food and Nutrition Policy, (2) that they are supported by research-based knowledge, (3) that they are objective in presentation, and (4) that they are supported across all agencies of USDA. The group is chaired by HNIS and includes representatives from 10 other USDA agencies--AMS, ARS, CSRS, ERS, ES, NAL, FNS, FSIS, HNIS, and OPA--and a liaison member from the DHHS. The group also serves as a means of communication among nutrition education specialists in the USDA agencies that provide guidance to their respective clientele.

3. Uniformity Among Departments

The Department continues to work with other agencies, especially DHHS, in promoting uniformity of dietary guidance messages. For example, on behalf of USDA, HNIS coordinated with DHHS all activities of the Federal Dietary Guidelines Advisory Committee, the review of Committee recommendations in the two Departments, and the development of final text for the third edition of the Dietary Guidelines for Americans. HNIS is represented on a DHHS Subcommittee on Dietary Guidance; on the Coordinating Committee for the National Cholesterol Education Program sponsored by the National Heart, Lung, and Blood Institute; and on the Nutrition Objectives Working Group of the DHHS Year 2000 Health Objectives. HNIS and DHHS' National Institute on Aging are working jointly to develop a factsheet series for healthy older adults on using the Dietary Guidelines.

B. Programs Initiated or Expanded

The Cooperative Extension System continues to focus on nutrition, diet, and health in its base programming. The following discusses nutrition education programming for low-income families with young children through the Expanded Food and Nutrition Education Program (EFNEP), a major educational initiative in food safety and quality and nutrition education programming on the U.S. Dietary Guidelines including diet and health promotion/chronic disease prevention, weight control, and promoting optimal nutrition during pregnancy.

1. Extension's Expanded Food and Nutrition Education Program

a. General

The Expanded Food and Nutrition Education Program (EFNEP) operates in all 50 States and in American Samoa, Guam, Micronesia, Northern Marianas, Puerto Rico, and the Virgin Islands. Extension professionals train and supervise paraprofessionals and volunteers who teach food and nutrition information and skills to low-income families.

The objectives of EFNEP are to assist low-income families and youth in acquiring the knowledge, skills, attitudes, and changed behavior necessary for consuming nutritionally sound diets, and to contribute to their personal development and the improvement of the total family diet and nutritional well-being.

Although funding has been level for many years, the program has shown increases in the participation rate due to increased work with groups. In FY 1990, 206,657 families participated in EFNEP compared to 201,807 in FY 1989. In FY 1990, 434,823 youth participated in 4-H EFNEP compared to 413,832 in FY 1989. Overall there were 641,480 adult and youth participants in EFNEP in FY 1990, an increase over FY 1989 of 4.2 percent.

Participants were reached by direct teaching contacts by 2,110.5 full-time equivalent (FTE) paraprofessionals. This represents an increase of 14.3 participants per FTE paraprofessional over the 1989 levels. In addition, 48,652 volunteers worked 561,577 hours (FTE of 269). At a minimum dollar value of \$5 per hour, the value of volunteers working in the EFNEP program in 1990 amounted to \$2,807,885.

All States report an increase in cooperation with other agencies and private groups in order to implement the program in a more efficient manner. Most States have established referral systems with other Federal food assistance programs such as Supplemental Feeding Program for Women, Infants, and Children (WIC), and Food Stamps. Other public and private groups include Indian Reservations, Head Start, schools, Foster Care, Boys & Girls Clubs, Commodity Foods, State Departments of Education, Health Departments, battered women's groups, single parents groups, YMCA, YWCA, Chicanos Por la Causa, Adult Basic Education, the Salvation Army, and Teen Parent Programs. Many persons are recruited from these programs into EFNEP, and many persons are referred to these programs or are made aware of these programs by EFNEP.

All States report the use of a standardized curriculum, with the majority using Eating Right is Basic (ERIB2) in both the adult and youth phases. An EFNEP family participant completes between 12 and 20 lessons in a standard curriculum before graduation from the program. Participants learn topics such as food safety, choosing healthy foods, meal planning, food storage and sanitation. Youth programs also included topics such as fitness, avoiding substance abuse, and home safety for homecoming children. In addition to ERIB2 or another curriculum, some States have developed special lesson series to meet the needs and interests of certain audiences, such as pregnant teens and homecoming children.

A variety of methods were used to monitor improvement in diets, nutrition knowledge, food behavior practices, and (in a few cases) health indices of homemakers and youth. Methods included Surveys I and II from the Eating Right is Basic (ERIB-2) curriculum, computer dietary analysis, counting servings from four food groups, and birth weights of infants born to EFNEP mothers.

Upon entry into EFNEP, a 24-hour food recall disclosed that 48 percent of homemakers in a sample group had a diet with one or more servings of each of the four food groups. Moreover, only 5.5 percent of the homemakers in the sample group had a diet with two or more servings of milk and meat and four or more servings of vegetables/fruit and bread/cereals. Upon graduation, 86 percent of the homemakers in a sample group had a diet with one or more servings of each of the four food groups, and 35 percent of the sample were eating the recommended number of servings from each food group.

States have given more attention to the number of hours of instruction and the time period for enrollment. Supervision and management by State staff have provided support for more frequent visits. This has resulted in shorter enrollment periods. States mention timeframes of 3-6 months or less than 12 months. Of all graduating homemakers in 1990, 80 percent graduated in less

than 12 months. States also report an increase in graduation rate and increased workloads per FTE paraprofessional.

States reported conducting concentrated staff development training in how to teach in small groups, also more volunteer training of teachers in schools. States also reported the development and use of videotapes for staff training purposes, as well as teaching visuals for participants.

b. Program Highlights

Many States specifically targeted pregnant teens and adult women at risk to help improve their prenatal and postpartum diets and, therefore, decrease the incidence of low birth weight and improve healthy births and infant nutrition. The risk of low birth weight is higher for women who are poor, black, younger than age 17, have little or no prenatal care, and have inadequate diets and gain less than 20 pounds during pregnancy. Each year more than a quarter of a million infants are born with low birth weight (under 5 pounds, 8 ounces). Low birth weight is most strongly associated with infant deaths that occur in the neonatal period or first month of life. Inadequate nutrition among pregnant women may account for as much as 57 to 65 percent of babies born with low birth weight. Alabama reported that of the 4,399 Today's Mom participants, 45 percent were teens. Nevada reported that pregnant teens in their program gained an average of 32.5 pounds which is near the recommended weight gain of 35 pounds, and the average birth weight was 7.13 pounds. In addition, Nevada reported that the percentage of teens breastfeeding from at least three to six months was 21 percent, well above the 15 percent national average for teens.

Arkansas estimated that 2,371 homemakers decreased the dollar amount spent for food, at a savings of \$235 per family (\$558,180). Gardening and food preservation activities had an estimated economic impact of \$261,413 for 616 of the families. Behaviors adopted by 1,782 of the families on food recalls and food behavior scores resulted in an estimated economic impact of \$1,082,428. Arkansas also estimated that 435 youth involved in food production and preservation provided an economic savings of \$54,066 to their families.

Wyoming reported that homemakers saved an average of \$22 and \$30 per month in two counties studied. This amounted to \$131,328 saved by those participating families.

With Federal EFNEP dollars remaining stable over the past several years, many States are seeking outside funding to help finance their EFNEP programs.

- o Indiana received a total of \$158,000 in grants to expand their "Have a Healthy Baby" program to reach pregnant adolescents and to pilot-test a special program for limited-resource audiences. They have titled that new effort FNEP PLUS for the addition of parenting and money management to the basic EFNEP food and nutrition curriculum.
- o Rhode Island initiated a commodity food campaign as a result of a \$4,400 grant from the Rhode Island Department of Human Services. Some 45,000 food stamp enclosures were created to advertise low-cost recipes and the nutritional value of commodity foods. These enclosures were mailed with the food authorization card. "How to

"Use Donated Foods," an informational brochure, was developed and distributed to 70,000 commodity food recipients.

In addition, EFNEP paraprofessionals demonstrated commodity food recipes, answered nutrition-related questions, and recruited EFNEP families in selected distribution centers throughout the State.

- New Hampshire received a joint grant from USDA's Food and Nutrition Service and the New Hampshire Food Stamp Program for a pilot nutrition education project with food stamp recipients. The grant included the development of four nutrition brochures, a six-lesson curriculum series for pregnant and parenting teens, installation of an 800 number hotline, adaptation of a correspondence course, and development of a "Low Cost Meals for Two Weeks" menu plan and accompanying recipes. The nutrition brochures were mailed out in the food stamp mailing on a quarterly basis. Over 13,200 food stamp families received the brochures each time. In addition, the curriculum series for pregnant and parenting teens entitled "Great Beginnings" has been completed and is currently being piloted in four locations across the State.

2. Ongoing Food Safety and Quality Programs in the Cooperative Extension System

- Model Programs in Food Safety

In FY 1991, \$1.5 million in special congressional funds were allocated to the Extension Service to improve educational programs in the area of food safety and quality. ES funded 36 model programs in six priority areas:

1. Increased understanding of the scientific and policy bases of risk management decisions.
2. Informed risk management practices for youth.
3. Enhanced utilization of the Food Animal Residue Avoidance Databank (FARAD).
4. Development of Hazard Analysis and Critical Control Point (HACCP) models.
5. Development of HACCP training materials.
6. Reduction of risk of foodborne illness from foods served to vulnerable individuals.

These projects are developing, implementing, and evaluating model food safety educational programs for various types of youth and adult target audiences (producers, processors, distributors, retailers, the food service industry, consumers, and others), and impact evaluations are expected to be completed in June 1992.

- Kansas Teaches About Microorganisms and Food

Food handler education is receiving much emphasis in food safety programs of the Cooperative Extension System. A "Microorganisms and Food" educational program was implemented in Kansas with school foodservice personnel, members of volunteer church groups, daycare providers, restaurant workers, and secondary students over the past 3 years and evaluated in 1991. As with new Extension initiatives, professionals also received training. This program was

also delivered to 80 home economists in State and area workshops. The professionals in turn taught 782 volunteers who reached another 6,525 people. Evaluation of participant knowledge and behavior revealed that 10,355 learners increased their knowledge regarding newly recognized food pathogens, essential food handling behaviors, and beneficial uses of microorganisms in food processing. Of this group, 5,286 individuals improved their food handling and storage practices.

- o Safe Food - Safe People in Nebraska

The pilot program "Safe Food - Safe People" was delivered to 33 employees in 17 child care centers in Nebraska. A 3-month followup evaluation indicated that participants from 12 of the centers adopted at least one of the following practices that will reduce risks from foodborne illness: improved handwashing techniques, checking food temperatures more often, using tongs to handle food, thawing frozen food in the refrigerator or microwave, using smaller containers for cold food storage, and requiring parents to bring treats that are purchased instead of homemade.

- o Volunteers Are Trained To Teach Safe Food Handling in Colorado

Information on safe food handling practices reached 45,284 Coloradans through programs and individual contacts. Eighty-four volunteers, trained in 14 counties to deliver targeted programs through the Master Food Preserver curriculum, contributed approximately 1800 hours delivering Cooperative Extension programs and reached 10,785 residents in 1990-91, exclusive of mass media work. A "Keep Food Safe" educational program was delivered to more than 700 community organizations and 204,682 individuals by 76 trained volunteers.

- 3. Ongoing Nutrition Education Programs in the Cooperative Extension System

- o "Noonlighting," Weight Control at the Worksite in North Carolina

North Carolina developed a worksite weight control program that won an ES-USDA IMPACT 2000 award. The program included 15 lunch hour education and walking sessions. At the end of the 1990 fiscal year, 45 of the 100 counties in North Carolina had conducted "Noonlighting." The program was offered primarily at worksites with a total of 3,330 participants enrolled. Sixty-four percent of the enrollees completed the series, with 53 percent reaching their weight-loss goal. Seventy percent lost an average of one-half pound a week.

- o Prevalence of Obesity in Kansas Is the Stimulus for Weight Control Programming

The Kansas State specialist trained 178 professionals in the use of three weight control programs that stress nutrition, exercise, and behavior change as the three key ingredients for taking weight off safely and maintaining weight control. Over the 4-year reporting period, 864 participants reported a loss of 7,833 pounds. The average weight loss per 10-15 week session was 8-9 pounds.

- o Texas Conducts "Nutrition Education for Effective Weight Control Impact Study

A program was conducted with 197 limited-resource homemakers to increase adherence to the US Dietary Guidelines, better weight control, or reduce incidence of health problems related to obesity such as heart disease, hypertension and diabetes, increase exercise and overall healthy lifestyle, and increase weight loss. There was a 40-percent increase in individuals reporting reducing fat in the diet, increasing variety in the diet, limiting use of sodium and sugar, exercising at least three times a week, and regularly monitoring blood sugar, blood pressure, and blood cholesterol values. Texas also produced an IMPACT 2000 award winning program entitled "The Minority Peer Educator Program." This program uses four soap-opera-type vignettes to teach older Americans about health problems including high blood pressure, obesity, and diabetes. Two are directed at African-Americans and two at Hispanics.

- o The Great Wyoming Shape Up Melt Down Improves Lifestyle Habits

A county-wide effort engaged 32 teams of 354 participants in a 2-month-long program to promote aerobic exercise and healthier lifestyles in the community. Nutrition and fitness information was provided to the teams through newsletters. "Energy minutes" were calculated to determine team progress. At completion the 32 teams logged 634,835 energy minutes, or 1,793 average minutes per individual.

- o Project LEAN Interagency Collaboration Encourages Use of Native Foods in Hawaii

Hawaii participated in a state-wide interagency program to reduce fat in the Hawaiian diet. Home economists in Hawaii County presented 79 programs reaching over 7,000 clients focusing on nutritious, low-fat foods, family nutrition, and health. Food and nutrition education programs were conducted on the islands of Kauai, Maui, Molokai, and Oahu.

- o Vermont Distributes USDA Dietary Guidelines Bulletin Series

From January 1989 through June 1991, a total of 556 individuals purchased the Dietary Guidelines letter series (USDA HGB 232-1 through 232-7). A pre-test/post-test evaluation was conducted. Five hundred pre-tests and 194 post-tests were completed. All individuals completing the post-test reported one positive change in their eating behaviors and significantly increasing their nutrition knowledge. The letter concept was viewed as a minimum intervention tool that has proven benefits for a reasonable cost when working with people who seek information.

- o New York Succeeds in Getting Nutrition Education Into Schools Statewide

"Nutrition for Life" is a comprehensive nutrition education program designed for New York State schools, grades K-12. The program was planned, developed, implemented, and evaluated by a team of Cornell University Cooperative Extension faculty members with advisory input from the Governor's Office and the New York State Department of Health. The program was assessed to determine dissemination and implementation as well as for impact on a group of 7th and 8th grade students from 103 sites. About half of the junior high teachers, one-third of the high school teachers, and one-fourth of the elementary teachers reported receiving "Nutrition for Life." Three-fourths of

those who received the program used it. Teachers who attended the training sessions were more likely to use the program materials than those teachers who were not trained. Use of "Nutrition for Life" was associated with significantly higher nutrition knowledge, more positive attitudes toward nutrition, and with healthier reported food choices than in classes where nutrition was not taught. In low-income schools, additional hours of "Nutrition for Life" teaching was associated with a significantly higher nutrition attitude and behavior score. The program received two awards--the Nutrition, Diet and Environment Award from the American Home Economics Association and ES-USDA's IMPACT 2000 recognition for exemplary extension programming.

- o West Virginia Focuses on Disease Prevention and Health Promotion

"Slimming Only Sensibly" (SOS) is a behavior modification, nutrition, and exercise program emphasizing individual and group weight management. More than 1,300 people have been reached with the SOS program statewide. "Blue Ribbon Babies Through Better Nutrition" is an educational series newsletter that has been received by more than 7,625 women throughout the State. Through nutrition programming evaluations, 66 percent of participants were found to have increased knowledge of food and nutrition; 60 percent reported increased knowledge of health and fitness; 61 percent reported improved dietary behavior and 42 percent reported improved health/fitness behavior.

- o Clemson University Collaborates with BiLo Grocery Stores

South Carolina has responded to dismal health statistics, including the lowest life expectancy in the United States, by developing a nutrition health promotion program with the BiLo Stores, Inc. Point-of-purchase materials were developed to give nutrition information to the public with referral to the Cooperative Extension System for additional nutrition education.

- o New Hampshire Promotes Healthy Lifestyles

The "LEAN Program (Lifestyle, Exercise and Nutrition) was conducted in 7 of New Hampshire's 10 counties in 1991. It is a 10-week series emphasizing a balanced approach to weight loss; it encourages physical activity, the Dietary Guidelines, behavior change, and group support. Of the 210 participants originally enrolled, 114 (54 percent) completed the program. Post-workshop evaluation revealed that 99 (87 percent) of the participants reported making at least one dietary or behavior change, and 96 (84 percent) reported making three or more changes. Eighty-six participants (75 percent) lost an average of 4-8 pounds. Six months later a followup survey with a 35-percent return rate revealed that 100 percent were continuing with the changes they made during the session. Forty-three participants indicated that they were continuing with three or more changes. Thirty-four of the participants had maintained their weight loss over the 6 months since the completion of the program.

- o Minnesota Programming Emphasizes the Relationship of Food Selection with Chronic Disease Risk Reduction

Decreased fat intake, recipe modification, and increased consumption of vegetables and fiber sources were common topics of educational programs conducted for health professionals, consumer groups, Extension Homemaker Study Groups, WIC and Senior Nutrition program participants. Educational efforts

have been increasingly directed at professionals, especially health professionals and educators, rather than directly to the lay public. In addition to traditional Extension sites, programs have been increasingly conducted at worksites and supermarkets and in cooperation with other professional organizations.

- o Maine Increases Participation in Nutrition Programs

Maine made a concerted effort to improve participation in its nutrition, diet, and health education programming. During a 4-year cycle, 48,346 people participated in programming, a 559-percent increase from baseline in 1988. Of the total, 42,797 documented increased knowledge and 2,470 people made behavior changes.

- o Kentucky Counties Predominantly Focused on Dietary Guideline Education

All counties offered one or more educational programs in food and nutrition. Programs focusing on the Dietary Guidelines predominated, including strategies for reducing fat, calories and cholesterol on the diet, weight control and fitness, eating better when eating out, eating foods with fiber, reducing sugar and sodium, daily food guide and variety in meal plans. "Working to Improve Nutrition" (WIN) is a program conducted by trained volunteers in 9 of 14 Extension areas. It is the only program nationwide which uses such Master Volunteers to teach nutrition.

- o The District of Columbia Improves Diets of Program Participants

During FY 1988-91, 45,785 residents were assisted by four home economists, three part-time training technicians, and approximately 250 volunteers in areas of nutrition, diet and health. In a random sample telephone survey of participants, 65 percent of the participants prepared more nutritious meals than they had prior to participation and reduced their food cost by 20 percent. Many low-income participants learned how to buy seasonally, preserve foods, and how to select low-cost, nutritious foods. Many eligible women took advantage of the WIC program through CES outreach efforts. Approximately 6,000 Asian and Hispanic immigrants learned about nutrition and American foods through the "Kitchen Language" program. The program helped them learn about American culture and household products as well as foods.

- o Coloradans Reached With Nutrition, Diet, and Health Programs

In the 1990-91 reporting year, 98,762 Coloradans were reached with information on improving nutrition, diet, and health practices. "Slim for Life" classes attracted 1,141 participants, 81 percent of whom met their weight-loss goals with a mean weight loss of 7.6 pounds. "Sports Nutrition" has reached 30,000 individuals through public programs and creative media approaches. "Mythbusters" is a 45-minute program on dispelling nutritional myths about sports nutrition. It has been presented to 19 schools (grades 3-6) and reached 2,633 students and teachers. "Diet to your Heart's Delight" is a collaborative program between CES and the American Heart Association of Colorado that is now offered in 143 restaurants, 3 fast-food chains, and 1 supermarket chain's deli department.

- o Arkansas Teaches the Fundamentals of Diet and Health

Aspects of the diet and health relationship were presented to 3,435 individuals through traditional classes, workshops, and one-to-one teaching. These individuals reported sharing what they learned with 22,549 additional people. Teaching efforts focusing on planning and consuming diets more nearly conforming to the Dietary Guidelines for Americans were received by 8,449 persons who reported sharing what they learned with 21,981 additional people. Resultant reported changes in practices were estimated to have saved \$391,399 through wiser use of the food dollar and improved nutritional status.

- o Maryland Uses Computerized Dietary Analysis in Nutrition Education Programs

Classes for youth and adults focused on human, infant, and child nutrition; Dietary Guidelines; food economics; nutritious meal planning and preparation; and diet analysis. Over 1,300 participants received dietary analysis. Statistical analysis of the dietary recalls indicates that the diets of many Maryland residents--regardless of gender, race, or income level--fail to meet the Recommended Dietary Allowances. Estimates of impacts of programming include 20,134 people who gained knowledge about nutrition; 4,921 were participants who were new to Extension. Volunteers who were trained numbered 207, and they reached an additional 3,411 people for Extension.

- o Nebraskans Are "Eating Today for a Healthier Tomorrow"

Some 1,400 participants in the "Eating Today for a Healthier Tomorrow" program reported significant changes in limiting their fat and cholesterol intake, selecting a healthful variety of foods, avoiding seasoning foods with salt and fat, selecting better diets to reduce risk of obesity, developing a healthier eating pattern, and partaking in a more appropriate amount of weekly exercise. A 6-month followup of 160 participants showed further improvement in limiting fat and cholesterol, and maintenance of many of the other behaviors. "Eating Today for a Healthier Tomorrow" was selected for an ES-USDA IMPACT 2000 award for excellence.

- o Tennessee Survey Indicates Diets Could Improve

During this reporting cycle, a random sample of 7,000 Tennessee homemakers indicated that though the survey subjects were consuming adequate servings of meats and dairy products, only 7 percent consumed the recommended 5 servings of fruits and vegetables and only 1 percent consumed the recommended 6 servings of breads and cereals.

- o Iowa Healthy Families Project Changes Health Behaviors

The purpose of the Iowa Healthy Families Project was to improve the nutrition, diet, and health of family members and to reduce the risk of chronic health problems. Specific goals of the project were to coordinate community health education resources into a comprehensive program, to make wellness promotion available to those who live in rural areas and lack access to traditional programs, to help participants improve eating habits, and to help participants adopt at least one wellness-promoting behavior. Participation in the program resulted in 1,200 individuals in 900 families reporting significant health behavior changes. The nutrition-related health promoting behaviors reported included 1,057 people improving eating habits, 747 increasing exercise, and

274 losing body weight. This program also received one of the ES-USDA IMPACT 2000 awards.

- o Impacting on the Increasing Prevalence of Pediatric Obesity: The California Model

Two nutritionists in California trained health and education professionals in the following current societal attitudes toward body size and conformation and their own attitudes towards overweight individuals; increasing societal pressures to conform to an idealized slender body image triggering serious health problems; normal variations in the growth patterns of children; factors contributing to the development of obesity in children; how to institute activities in their communities to make an impact on the prevalence of pediatric obesity; providing sound advice to parents on children, growth, and weight. A survey was conducted 4 weeks after training which had a 71-percent response rate. One hundred percent of the respondents reported that they felt more empathetic towards overweight children and adults. Increases in cognitive knowledge ranged from 68 to 89 percent. Seventy-three percent stated that the training had significantly influenced the kind of advice given to parents and caregivers about children and weight. This program also received one of ES-USDA IMPACT 2000 awards.

4. National Agricultural Library Programs

The Food and Nutrition Information Center (FNIC) celebrated 20 years of service in FY 1991. Founded in 1971 through an interagency agreement with the Food and Nutrition Service (FNS), FNIC serve as a national repository of educational materials available to Child Nutrition Program (CNP) staff. FNS continues to fund FNIC with an \$110,000 interagency agreement which allows FNIC to serve professionals involved in USDA nutrition programs throughout the United States. Additionally, FNIC serves other health professionals, consumers, and media with information related to food and human nutrition.

In FY 1991, FNIC answered over 4,000 reference questions, responded to over 6,000 requests for publications by distributing over 57,000 publications, and worked with 194 onsite visitors to the Center.

- o New Bibliographies Information Products

NAL Quick Bibliographies, Special Reference Briefs, and other publications were published on the following topics in FY 1991: Adult/Patient Nutrition Education Materials; Fish Oil: Role of Omega-3s in Health and Nutrition; Food Service: Printed Materials and Audiovisuals; Infant Nutrition, Nutrient Composition of Selected Grains as Food; Nutrition and AIDS; Pesticide Residues in Food Sources; Free or Low-Cost Food and Nutrition Materials; and Food and Nutrition Microcomputer Software List.

The nationally recognized bibliographic series Pathfinders was renamed this year to Nutri-Topics. These brief reading lists of print and audiovisual materials are reviewed by nationally recognized experts and were prepared on the following topics in 1991: Sensible Nutrition, Adolescent Pregnancy and Nutrition, Vegetarian Nutrition, and Anorexia Nervosa and Bulimia.

The Bibliography of Agriculture, Nutrition Education Resource Guide: An Annotated Bibliography of Educational Materials for the WIC and CSF Programs, was published in 1991 through the culmination of a multi-year interagency agreement with FNS. Ten thousand copies were printed; GPO mailed copies

directly to local and State agencies. They are also distributed by FNS and FNIC.

- o National Food Service Management Institute Works With FNIC

NAL entered into a cooperative trust fund agreement with the University of Mississippi to allow FNIC to assist with clearinghouse activities of the National Food Service Management Institute (NFSMI). The agreement, which totaled \$82,000, provides for 1.5 FTE staff for reference and support services, computer hardware and software, direct lending for CNP staff throughout the United States, and acquisition of educational materials. FNIC and NFSMI are linked through an extension to a toll-free number located at the Institute's offices in Mississippi. CNP personnel are able to dial toll-free to receive personal reference and research services from a nutritionist located at FNIC and receive free photocopying and direct loan of educational materials.

- o National Microcomputer Software Demonstration Center

The Software Demo Center is a unique service provided by FNIC. Commercial producers have donated complete systems or demonstration disks and documentation for over 150 software programs for personal computers. Programs cover dietary analysis, nutrition education, food service management, health education, and recipes. Visitors come to the Center to use the software. The programs are not available for loan.

5. Food and Nutrition Service Programs

- o Omnibus Budget Reconciliation Act of 1988
(Public Law 101-239)

DHHS, in consultation with USDA, was charged with the development and dissemination of a model application form using current program eligibility criteria to provide simultaneous application for pregnant women and children under age 6 for the following programs: Maternal and Child Health Block Grant, Medicaid, Migrant and Community Health Centers Programs, Grants for the Homeless, Head Start, and WIC. The model form was published in the Federal Register in October 1991. The use of the form in total or in part is optional for States.

- o Interaction With Health Care Financing Administration
(Medicaid)

FNS is coordinating with Medicaid to develop a memorandum to be sent to FNS regional offices on State guidance for WIC/Medicaid coordination of nutrition services. It is also anticipated that FNS and Medicaid will issue a joint memorandum to their respective regional offices on how to coordinate the provision of and payment for special nutritional formulas through WIC and State Medicaid Programs.

- o Interaction With Office of Migrant Education

A Memorandum of Understanding (MOU) was developed between USDA and the U.S. Department of Education's Office of Migrant Education to encourage information sharing, improve coordination and enhance communication, and foster migrant referrals to the WIC Program. The MOU was signed by officials of the two Departments and distributed in April 1991. The intent of this initiative is

to improve services to migrant farmworkers and their families who are an especially high-risk, hard-to-reach population often subjected to extreme poverty, malnutrition, and poor health care.

- o Expanded Food and Nutrition Education Program (EFNEP)

Work is currently underway to develop a Memorandum of Understanding between FNS and EFNEP. Because EFNEP serves the same target population as the WIC Program, EFNEP's involvement will be encouraged in the following activities for WIC participants: 1) conducting group nutrition education classes; 2) identifying appropriate nutrition education materials for use with WIC participants; 3) providing appropriate drug abuse materials; and 4) involving EFNEP aides in breastfeeding promotion.

- o Surgeon General's Task Force on Healthy Children Ready To Learn

A task force, which consists of representatives from various agencies within the Departments of Agriculture, Education, and Health and Human Services, is working to identify strategies to achieve the President's goal: "By the year 2000, all children in America will start school ready to learn." One of the planned activities is the "Surgeon General's Conference on Healthy Children Ready to Learn: The Critical Role of Parents," which will be held in February 1992. USDA is playing an active role in planning the conference and will also be contributing to its financial support.

- o U.S. Department of Education's Even Start Program

USDA is encouraging cooperation with the Department of Education's Even Start Program at the WIC local agency level. This program is being implemented as a demonstration project for 2 years. The goal is to help parents become more effective partners in the education of their children. Even Start projects will teach parents literacy skills and ways to prepare their young children to succeed in school. Local WIC Programs will play a strong role in this effort.

- o Interagency Work Group for the President's Healthy Start Initiative

Recognizing that infant mortality is most severe in certain cities and communities, the Federal Government, through a new Healthy Start initiative coordinated through DHHS, will award \$25 million to 10 cities with exceptionally high rates of infant mortality. The awards were announced on September 27, 1991. USDA programs, most notably WIC, are involved in this effort at the local, State, and Federal levels. Approximately \$70 million has been budgeted for this initiative in FY 1992.

- o Maternal and Child Health Interorganizational Nutrition Group (MCHING) Conference

FNS participated in the Maternal and Child Health Interorganizational Nutrition Group (MCHING) Conference and commented on draft reports of the proceedings. Although USDA does not endorse all MCHING recommendations, the Department views the meeting as a positive step towards the coordination and collaboration of maternal and child nutrition services.

- o Commodity Specifications Changed by AMS

Several nutrition-related changes were made in the existing specifications for commodities purchased by AMS for distribution to various eligible institutions. Changes, like those listed below, are made on an ongoing basis as concerns are identified and technology is developed that allows the acceptability and functionality of the commodities to be maintained.

1. Ground beef: The maximum fat level permitted was reduced 2 percent by weight, from 24 to 22 percent.
2. Canned pork: The maximum fat level permitted was reduced 2 percent by weight, from 20 to 18 percent.
3. Canned boned poultry: The discount range for fat was eliminated so that any product with an average fat content above 10.5 percent would be rejected. Previously, product with an average fat content of 10.6 to 11.0 percent was accepted with a discount in the contract price.
4. Dried egg mix: The maximum salt level permitted was reduced 0.2 percent by weight, from 1.0 to 0.8 percent.
5. Canned fruit: Unless otherwise specified, the packing media may be unsweetened fruit juice, unsweetened fruit juice from concentrate, "light syrup," "lightly sweetened fruit juice and water," or "lightly sweetened fruit juice." If unsweetened fruit juice or juice from concentrate are used, the Brix measurement shall average not less than 10° but not more than 18°. This permits the use of less sugar than before, when the range permitted was 12° to 18°.

- o AMS Continues To Grade More "USDA Select" Beef

Since the beef grade "USDA Good" was renamed "USDA Select," there has been an increase in the amount of this beef graded by AMS. When the name change became effective in November 1987, USDA Good represented less than 2 percent of the total graded steer and heifer beef supply. By July 1991, USDA Select represented over 21.8 percent.

- o Low-fat Beef Patty Tested by AMS

During the 1991 school year, AMS purchased four different types of low-fat beef patties and tested their acceptability in schools. Following an evaluation of this program, a decision will be made about additional purchases of this product. The evaluation will take into account feedback from recipients of the test purchase and analysis of the technologies used to produce the patties.

- o Nutrition Education in the Special Supplemental Food Program for Women, Infants, and Children (WIC)

WIC participation continued to increase in FY 1991 from an average of 4.6 million participants each month to 5.3 million. WIC nutrition education services were provided to an additional 300,000 participants.

- o National WIC Nutrition Services Meeting

The first National WIC Nutrition Services Meeting was held August 26-28, 1991, in Memphis, Tennessee. The meeting was entitled "Challenges, Changes, and Choices for the 1990s: A Conference for Skill Building and Sharing." Approximately 650 State WIC nutrition coordinators and local level staff who work directly with WIC participants attended the conference. Topics covered during the conference included nutrition education for clients; staff education and training; alcohol and other drug use prevention; maternal and child health; and breastfeeding promotion. The next meeting is tentatively scheduled for 1993.

- o Breastfeeding Promotion Incentive Grants

As an initiative for FY 1991, FNS is making available, on a competitive basis, grants to WIC State and local agencies to support staff time and related costs to establish an incentive-based "breastfeeding incentive demonstration project." The objective of the projects is to 1) use privately donated items/services as incentives to encourage pregnant WIC participants to breastfeed their infants; and 2) evaluate whether these incentives improve the incidence and duration of breastfeeding among WIC participants. Grantees are to establish projects which have a high likelihood of being sustained after the grant period ends through inkind contributions from businesses, organizations, breastfeeding support groups and interested individuals. FNS awarded several grants in FY 1991, with the option to make additional awards in FY 1992 if funds become available.

- o Emphasis on Breastfeeding Promotion

Breastfeeding Promotion Consortium: In June 1990 USDA convened a Breastfeeding Promotion Consortium of 15 health professional, government, and public health organizations at the suggestion of the American Academy of Pediatrics. Its purpose is to collaboratively promote breastfeeding. The Consortium has since grown and includes 23 organizations. In 1991, the Consortium met twice. A fourth meeting of the full Consortium will be held in early 1992. USDA, with the support and endorsement of the Consortium, agreed to accept lead responsibility for developing a national campaign to promote breastfeeding. The campaign will be implemented through national-level planning committees (the Consortium, a Steering Committee, and a Technical Advisory Group) working in collaboration with State and local groups. In June 1991, the Technical Advisory Group, composed of experts in breastfeeding promotion, lactation consultation, social marketing, and media relations, was convened to provide technical advice to USDA during the development of the campaign.

Regulations: It is anticipated that a final WIC rule establishing a national definition for the term "breastfeeding" and setting standards for the promotion and support of breastfeeding for WIC State and local agencies, pursuant to Public Law 101-147, will be published early in FY 1992.

- o WIC's Role in Encouraging Immunizations

FNS is continuing to work with the Centers for Disease Control (CDC), Division of Immunization, DHHS, to increase immunization rates among preschool-age WIC participants who are 12 months through 2 years of age. FNS is aggressively emphasizing coordinated efforts between State WIC Directors and State Immunization Program Managers and other health and human service programs as a

WIC Program priority. FNS also sent a letter to State WIC Directors asking that they aggressively promote, at a minimum, measles immunizations for WIC participants. CDC sent a similar letter to the State immunization program managers encouraging them to coordinate with the WIC Program. CDC, in conjunction with several WIC State agencies, is also conducting demonstration projects to explore various mechanisms for increasing immunization rates among WIC participants.

- o National Food Service Management Institute

Public Law 101-147 authorized the establishment of the National Food Service Management Institute through FY 1994 at the University of Mississippi to improve the quality and operation of Child Nutrition Programs through training, technical assistance, research, and management support for child nutrition foodservice programs. Funding for FY 1990 was set at \$500,000, with appropriations of \$1,143 million for FY 1991. A permanent staff is in place, as well as two advisory boards. Now in its second year of operations, the Institute has established a clearinghouse for information dissemination and retrieval, initiated training programs, and begun research projects to support future training needs.

C. Nutrition Education and Information Highlights

- o Nutrition Education and Training (NET) Program

Nutrition education continues to be provided as an integral component of the WIC benefit package. Public Law 101-147 specified an annual (FY 1990 through 1994) increase in the amount of NET funding for the conduct of nutrition education and information provided to child nutrition programs.

- o Drug Abuse Education in the WIC Program

Public Law 100-690, the Anti-Drug Abuse Act of 1988, directed USDA to conduct a study of appropriate methods of drug abuse education for WIC participants and to prepare and distribute suitable materials. A contract to conduct the study and develop a resource manual for WIC local agency professionals was awarded in March 1989 and a study report issued to Congress in January 1990. Based upon the study's recommendations, FNS developed a videotape, pamphlet and poster to warn participants about the dangers of drug use during pregnancy and lactation. The resource manual "Providing Drug Abuse Information and Referrals in the WIC Program: A Local Agency Resource Manual" should be available for distribution early in FY 1992. A videotape to train WIC local agency professionals on screening and making referrals for abuse assessment is currently being developed and should be available for distribution in FY 1992. Companion pieces for both videotapes, as well as a Spanish version of the pamphlet to warn WIC participants about the dangers of drug use during pregnancy and lactation, will be produced in FY 1992.

- o Nutrition and Feeding During Infancy: A Handbook for Use in the WIC and CSF Programs

This handbook is being developed by FNS for use as a reference guide for nutritionists and other health professionals who provide nutrition education to caretakers of infants in the WIC and CSF Programs. The publication presents information on the nutritional needs of infants, infant development and feeding skills, breastfeeding and formula feeding, infant foods, food purchasing, and safe food preparation and storage.

- o Resource Guide

The Food and Nutrition Information Center is updating The Nutrition Education Resource Guide: An Annotated Bibliography of Education Materials for the WIC and CSF Programs. This guide describes references and educational materials from a wide range of sources. It was published in fall 1991.

- o Paraprofessionals in the WIC Program. Guidelines for Developing a Model Training Program

This training manual is designed to provide technical assistance to regional, State, and local WIC Program staff on the use and training of paraprofessionals in the WIC Program. Optimal role functions for WIC Nutrition Assistants are identified. Specific training needs of WIC paraprofessionals and components of a model training program are also discussed.

- o Fliers for the Food Distribution Program on Indian Reservations (FDPIR)

FNS is developing a series of 12 nutrition education fliers that present basic lessons on health and nutrition, and include recipes to encourage healthy cooking. Topics focus on health conditions prevalent among the Native American population, including diabetes, heart disease, hypertension, and obesity. The fliers also address health issues such as special nutritional needs during pregnancy, improved food preparation techniques, and eating habits, with emphasis geared to the appropriate use of USDA commodities. Each month, for a year, one of the fliers will be issued along with every FDPIR food package.

IV. FUNDING LEVELS (1986-92)

The expenditures for human nutrition research and human nutrition education and information by the several agencies in USDA for FY's 1986 through 1991 are summarized in table 2. The congressional appropriation for FY 1992 is also included. The total amount of human nutrition research support increased from \$60.7 million in FY 1986 to \$72.2 million in FY 1991, an increase of 19 percent. During the same period, support for human nutrition education and information rose from \$132.1 to \$178.2 million, an increase of 35 percent. The total support for human nutrition in the congressional appropriation for FY 1992 is \$278.9 million or 45 percent more than was expended in FY 1986.

Table 3 shows the amount of human nutrition research support within the Department for this period by subject area categories and agency. Over half of the human nutrition research effort is focused on determining nutrient requirements/health maintenance at all stages of life. About one-sixth of the effort relates to the development of methods for measurement of nutritional status and collection of food consumption information. Approximately one-sixth of the funds is used to measure the content and bioavailability of nutrients in foods. The funds shown in the table do not include funds provided by the States or other sources and used in conjunction with those funds provided by the Cooperative State Research Service (CSRS).

Funds available for competitive research grants in human nutrition through the National Research Institute Competitive Grants Program (NRICGP) were increased in the appropriation from \$1.4 million in FY 1990 to \$2.59 million in FY 1991.

Table 2

U.S. DEPARTMENT OF AGRICULTURE
HUMAN NUTRITION RESEARCH, EDUCATION, AND INFORMATION
SUPPORT (FY 86-92)

HUMAN NUTRITION RESEARCH
(\$ in Millions)

	Fiscal Year						
	1986 actual	1987 actual	1988 actual	1989 actual	1990 actual	1991 actual	1992 estimate
ARS	37.8	40.6	44.3	45.7	47.9	49.6	49.9
CSRS	7.9	7.5	7.6	6.9	8.1	10.7	13.0
HNIS	12.8	6.1	7.1	7.7	7.9	8.5	9.4
ERS	0.7	1.2	1.0	0.9	0.9	1.1	1.1
FNS	<u>1.5</u>	<u>0.5</u>	<u>0.5</u>	<u>0.6</u>	<u>2.8</u>	<u>2.3</u>	<u>8.9</u>
TOTAL	60.7	55.9	60.5	61.8	67.6	72.2	82.3

Human Nutrition Education and Information

ES	73.5	73.5	75.0	75.0	74.6	77.2	77.7
HNIS	0.7	0.7	1.2	1.1	1.1	1.4	1.4
FNS	57.0	60.4	65.5	71.6	86.6	98.7	116.6
FSIS	0.4	0.1	0.1	0.2	0.1	0.1	0.1
NAL	<u>0.5</u>	<u>0.4</u>	<u>0.5</u>	<u>0.7</u>	<u>0.7</u>	<u>0.8</u>	<u>0.8</u>
TOTAL	132.1	135.1	142.3	148.6	163.1	178.2	196.6

TOTAL RESEARCH,
EDUCATION, AND
INFORMATION

192.8 191.0 202.8 210.4 230.7 250.4 278.9

Table 3
 USDA NUTRITION RESEARCH PROGRAM SUPPORT (FY 86-92)
 (\$ in Millions)

	Fiscal Year						
	1986 actual	1987 actual	1988 actual	1989 actual	1990 actual	1991 actual	1992 estimate
1. Nutrient Requirements/ Health Maintenance							
CSRS	3.7	4.8	4.2	4.0	4.2	6.0	7.4
ARS	27.5	29.9	31.0	33.3	37.7	38.1	39.4
Total	31.2	34.7	35.2	37.3	41.9	44.1	46.8
2. Nutritional Status/ Food Intake							
CSRS	2.4	1.4	1.8	1.3	2.4	2.5	3.1
ARS	3.1	3.9	3.9	4.0	2.5	3.3	4.5
HNIS	9.9	3.2	3.9	4.8	4.9	5.4	6.2
FNS	---	---	---	0.1	---	---	---
Total	15.4	8.5	9.6	10.2	9.8	11.2	13.8
3. Use of Food/Food Choices							
CSRS	0.2	0.3	0.2	0.3	0.3	0.3	0.3
HNIS	1.1	1.1	1.3	1.1	1.1	1.2	1.2
ERS	0.4	0.9	0.7	0.8	0.8	1.0	1.0
FNS	---	---	---	---	0.1	---	0.3
Total	1.7	2.3	2.2	2.2	2.3	2.5	2.8
4. Nutrient Composition/ Bioavailability							
CSRS	1.6	1.0	1.4	1.2	1.2	1.8	2.1
ARS	7.2	6.8	9.4	8.4	7.7	8.2	6.0
HNIS	1.8	1.8	1.9	1.8	1.9	1.9	2.0
Total	10.6	9.6	12.7	11.4	10.8	11.9	10.1
5. Nutritional Impacts of Programs							
CSRS	---	---	0.1	0.1	0.1	0.1	0.1
ERS	0.3	0.3	0.1	0.1	0.1	0.1	0.1
FNS	1.5	0.5	0.5	0.5	2.7	2.3	8.6
Total	1.8	0.8	0.7	0.7	2.9	2.5	8.8
TOTALS							
CSRS	7.9	7.5	7.7	6.9	8.2	10.7	13.0
ARS	37.8	40.6	44.3	45.7	47.9	49.6	49.9
HNIS	12.8	6.1	7.1	7.7	7.9	8.5	9.4
ERS	0.7	1.2	0.8	0.9	0.9	1.1	1.1
FNS	1.5	0.5	0.5	0.6	2.8	2.3	8.9
USDA Total Nutrition Research	60.7	55.9	60.4	61.8	67.7	72.2	82.3

Table 4 presents a breakdown of human nutrition education and information expenditures and budgets by subject category for the FY's 1986 through 1991.

A summary of actual expenditures and estimated support and the congressional appropriation is given in table 5 for the five Human Nutrition Research Centers and other laboratories or centers of the Agricultural Research Service (ARS) for FY's 1986 through 1991. The net figure refers to funds to the location, while the gross amount includes overhead costs.

The Center at Tufts University in Boston is operated by ARS as a Government-owned, contract-operated (GOCO) facility. The Center at Baylor College of Medicine in Houston is operated by ARS through a cooperative agreement.

Human nutrition research support at ARS Regional Research Centers and other laboratories is shown in table 6. These studies help to ensure that problems and opportunities in human nutrition are considered in research directly related to the quality of the food supply.

Each year WIC State agencies must spend a minimum total for all States of \$8 million nationwide for breastfeeding promotion activities. These expenditures must be made from States' WIC administrative grants (or other sources) and do not constitute additional Federal appropriations.

V. COORDINATION AND ADVISORY MECHANISMS

A. Coordination Within the Federal Sector

Table 7 describes the interlocking network of human nutrition research and education activities across Federal Departments. The acronyms and abbreviations are defined on pp. ii - iii.

o Interagency Committee on Human Nutrition Research (ICHNR)

The ICHNR continued to coordinate human nutrition research activities at the Federal level under the leadership of co-chairpersons, Dr. Charles Hess (January 1 to April 30), Assistant Secretary for Science and Education, Dr. Harry Muzzman (May 1 to December 30), Acting Assistant Secretary for Science and Education, USDA, and Dr. James Mason, Assistant Secretary for Health, DHHS. Meetings were held at quarterly intervals with representatives from member Departments and agencies as follows: Agency for International Development, USDA, National Aeronautics and Space Administration, Department of Commerce, Department of Defense, DHHS, National Science Foundation, Department of Veteran Affairs, and Office of Science and Technology Policy (OSTP). Scientific topics discussed at these meetings included (1) State isotopes and radioisotopes in human nutrition research, and (2) future directions for nutrition research and training.

During the year several followup activities were conducted in relation to the stable and radioactive isotope needs for human nutrition research. The ICHNR reported to the FCCSET through the Committee of Life Sciences and Health and met with representatives of the OSTP. No Federal Government action has been undertaken to resolve the issue.

The fifth conference for Federally Supported Human Nutrition Research Units and Centers was held February 20-21, 1991, in Bethesda, MD. A report of the conference was published in the American Journal of Clinical Nutrition

Table 4

USDA FOOD AND NUTRITION EDUCATION AND INFORMATION SUPPORT (FY 86-92)
(\$ in Millions)

	Fiscal Year						
	1986 actual	1987 actual	1988 actual	1989 actual	1990 actual	1991 actual	1992 estimate
Extension Service ^{1/}							
Extension (Formula estimate)	15.9	15.9	16.4	16.4	16.4	16.7	17.2
Expanded Food and Nutrition Education Program (EFNEP)	<u>57.6</u>	<u>57.6</u>	<u>58.6</u>	<u>58.6</u>	<u>58.2</u>	<u>60.5</u>	<u>60.5</u>
Total	73.5	73.5	75.0	75.0	74.6	77.2	77.7
National Agricultural Library							
Food, Nutrition and Human Ecology Staff	0.5	0.4	0.5	0.7	0.7	0.7	0.7
Nutrition Education Initiative				<u>---</u>	<u>---</u>	<u>0.1</u>	<u>0.1</u>
Total				0.7	0.7	0.8	0.8
Human Nutrition Information Service							
Guidance and Education Research Branch	0.7	0.7	1.2	1.1	1.1	1.4	1.4
Food and Nutrition Service ^{1/}							
Nutrition Education & Training Program (NET)	5.0	5.0	5.0	5.0	5.0	5.0	10.0
Special Supplemental Food Program for Women, Infants and Children (WIC) ^{2/}	<u>52.6</u>	<u>55.4</u>	<u>60.5</u>	<u>66.6</u>	<u>81.6</u>	<u>93.7</u>	<u>106.6</u>
Total	57.6	60.4	65.5	71.6	86.6	98.7	116.6
Food Safety and Inspection Service							
Nutrition Labeling	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Nutrition and Sodium Information*	0.1	0.02	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>
Sodium Monitoring Program*	0.2	0.01	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>
FDA/FSIS Labeling Consistency*	<u>---</u>	<u>---</u>	<u>---</u>	<u>0.1</u>	<u>---</u>	<u>---</u>	<u>---</u>
Total	0.4	0.13	0.1	0.2	0.1	0.1	0.1
USDA Total Nutrition Education and Information	132.7	135.1	142.3	148.6	163.1	178.2	196.6

^{1/} Most funds are distributed to and managed by State agencies.

^{2/} Estimate of State administrative funds allocated for nutrition education.

*Programs discontinued.

Table 5

AGRICULTURAL RESEARCH SERVICE
HUMAN NUTRITION RESEARCH SUPPORT (FY 86-92)

Estimated Funds (\$ in Millions)

		Fiscal Year						
		1986 actual	1987 actual	1988 actual	1989 actual	1990 actual	1991 actual	1992 estimate
BHNRC, Beltsville, MD	Gross	7.91	8.34	8.42	8.12	8.27	8.69	9.23
	Net	7.02	7.41	7.35	7.31	7.48	7.82	8.31
GFHNRC, Grand Forks, ND	Gross	6.36	6.66	7.11	7.03	7.29	7.70	8.07
	Net	5.64	5.92	6.32	6.33	6.59	6.93	7.26
HNRCA, Boston, MA	Gross	11.75	12.76	13.68	14.06	14.26	14.56	14.57
	Net	11.16	12.12	12.99	13.35	13.54	13.83	13.84
CNRC, Houston, TX	Gross	4.43	5.43	7.65	9.07	10.43	10.43	10.70
	Net	3.93	4.88	6.99	8.34	9.63	9.91	10.17
WHNRC, San Francisco, CA	Gross	3.66	4.23	4.49	4.46	4.67	5.02	5.11
	Net	3.25	3.76	3.95	4.01	4.22	4.52	4.60
TOTAL, HN Centers	Gross	34.11	37.42	41.35	42.74	44.92	46.40	47.68
	Net	31.00	34.09	37.60	39.34	41.47	43.01	44.18
Other ARS HN Research	Gross	3.65	3.18	3.01	2.96	2.96	3.19	2.25
	Net	3.24	2.86	2.65	2.66	2.67	2.72	2.03
TOTAL, Human Nutrition	Gross	37.76	40.60	44.36	45.70	47.87	49.59	49.93
	Net	34.24	36.95	40.25	42.00	44.14	45.73	46.21

Table 6

AGRICULTURAL RESEARCH SERVICE

OTHER ARS HUMAN NUTRITION RESEARCH SUPPORT (FY 86-91)*
(\$ in Thousands)

		Fiscal Year						
		1986 actual	1987 actual	1988 actual	1989 actual	1990 actual	1991 actual	1992 estimate
Beltsville, MD	Gross	---	---	128.7	121.8	116.8	125.1	---
	Net	---	---	111.8	109.6	105.6	106.7	---
Ithaca, NY	Gross	601.3	750.9	765.0	755.4	743.0	785.1	384.5
	Net	533.5	675.9	676.0	679.7	671.8	669.5	346.6
Wyndmoor, PA	Gross	667.1	303.1	---	---	---	---	---
	Net	591.9	272.9	---	---	---	---	---
Peoria, IL	Gross	985.5	982.4	1,017.5	1,007.1	1,068.1	1,144.2	738.4
	Net	874.5	884.3	898.8	906.3	965.8	975.8	665.6
Albany, CA	Gross	959.2	712.7	653.8	493.0	483.9	519.7	530.2
	Net	851.1	641.5	576.3	443.6	437.6	443.2	478.0
Hyattsville, MD	Gross	433.5	432.7	443.1	580.0	545.3	613.9	600.1
	Net	<u>384.6</u>	<u>389.5</u>	<u>391.0</u>	<u>521.9</u>	<u>493.1</u>	<u>523.5</u>	<u>541.0</u>
	Gross	3,646.6	3,181.8	3,008.1	2,957.3	2,957.1	3,188.0	2,253.2
	Net	3,235.6	2,864.1	2,653.9	2,661.1	2,673.9	2,718.7	2,031.2

*Excludes Human Nutrition Centers.

Table 7. Human Nutrition Research and Education Activities (Coordination within the Federal Sector)

Human Nutrition Research and Education Activities (Coordination within the Federal Sector)-continued

	USDA	DHHS	AID	BLS	CB	DOD	NASA	DVA	EPA	NMFS	DOE	DOT	FTC
Head Start & Child and Adult Care Food Program	FNS												
Nutrition Educ. Committee for Maternal & Child Nutri. Publ.		FNS, ES, NAL, HNIS			Head Start, MCH, IHS								
Inter-Program Coord. through Income Eligibility Determ.	FNS			X									
Nat'l Health Obj. Yr. 2000		HNIS, FNS, ES		X									
Nat'l Cholesterol Educ. Progr.		HNIS, FNS, ES			NIH								
DGWG			X	X									
MOU between ES and FDA	ES, HNIS		FDA										
Ad Hoc Committee on Health Promotion through the Schools		HNIS, FNS, NAL			PHS, IHS, MCH		X				X	X	
HNIS/NCHS Weights and Measures Group		HNIS		CDC									
Continuing Survey Users' Group	X		X		X						X	X	X
Interagency Group on Exposure Assessment		ERS-Chr, HNIS, AMS, NASS		FDA							X		
Food Grouping System/EPA Working Group		HNIS-Chr									X		
Interagency Pesticide Sampling Protocol Working Group	AMS-Chr, HNIS		FDA								X		

54:164-168, 1991. A compilation of the complete abstracts of the fourth conference was published by the ICHNR in late 1990.

o Dietary Guidance Working Group

The Dietary Guidance Working Group, formed under the Subcommittee for Human Nutrition in 1986, continues to review all USDA publications that present dietary guidance information, including prospectuses and publication drafts. The review process is thorough and timely to ensure that guidance conforms to the Dietary Guidelines and is consistent and supportive across USDA agencies and the Federal Government. The group, composed of representatives from 10 USDA agencies and a DHHS liaison, also serves as a means of communication among nutrition education specialists in the USDA agencies that provide guidance to their clientele. The group has also been reviewing dietary guidance materials from DHHS. A Memorandum of Understanding establishing the procedures by which the Secretaries of USDA and DHHS will carry out the National Nutrition Monitoring and Related Research Act of 1990 legislation to review and approve dietary guidance for the general public is in final clearance by both Departments.

o The Ad Hoc Committee on Health Promotion Through the Schools

This committee was established in 1983 to coordinate research efforts and promote information sharing among Federal agencies concerned with school health programs and services. The committee holds bimonthly meetings which are coordinated through the DHHS Office of Disease Prevention and Health Promotion and attended by representatives from the U.S. Departments of Agriculture, Defense, Education, Health and Human Services, and Transportation.

o Nutrition Education Interactions

HNIS serves as the USDA representative to Project LEAN (Lowfat Eating for Americans Now), a national health promotion program under the leadership of the National Center for Nutrition and Dietetics, designed to help Americans lower their intake of dietary fat. HNIS represents the Department on the Cooperating Group for a medical education program, Rx Nutrition: Good Health In Practice," for the 67,000 primary care physicians nationwide.

o The Nutrition Education Task Force

This task force was established in 1985, as a continuation of the Sodium Education Task Force, to focus on broader issues in nutrition and food safety. The task force meets several times a year to share resources and information. Members include Federal agencies such as USDA's Human Nutrition Information Service and Food Safety and Inspection Service, DHHS's National Heart Lung and Blood Institute, National Cancer Institute, and Food and Drug Administration; industry groups such as the International Food Information Council, the Food Marketing Institute, the National Food Processor's Association, the Grocery Manufacturer's Association, and the National Restaurant Association; consumer groups such as the Center for Science in the Public Interest and Public Voice.

o USDA Development of the Food Grouping System in Cooperation with EPA and FDA

HNIS, in cooperation with EPA and FDA, is developing a Food Grouping System to translate data on foods as consumed into a form that can be linked with

pesticide residue data. HNIS has worked with the other two agencies since the earliest planning phases of the project to assure that the system meets their needs.

- o Pesticide Data Program

The Pesticide Data Program (PDP) is a comprehensive, multi-agency program to collect and analyze pesticide use and residue data regarding actual concentration levels in food. The PDP is administered by four Department agencies--AMS, NASS, ERS, and HNIS--which coordinate their efforts through regular interagency meetings.

- o Fish Contamination/Consumption Group

This is an informal interagency group that includes the Environmental Protection Agency, Food and Drug Administration, Marine Fisheries, ERS, and HNIS. The group exchanges information needed for each agencies responsibilities.

- o OMB Task Force on Household Survey Redesign

The objectives are for agencies to obtain more current information on future redesign plans. Recent topics include reports of work being done on computer-assisted telephone interviewing (CATI) and computer-assisted personal interviewing (CAPI).

- o Interagency Board for Nutrition Monitoring and Related Research

The Interagency Committee on Nutrition Monitoring, established in 1988, was renamed the Interagency Board for Nutrition Monitoring and Related Research and are major users of nutrition monitoring data. The Board, co-chaired by the USDA Assistant Secretary for Food and Consumer Services and the DHHS Assistant Secretary for Health, includes members from all Federal agencies that conduct nutrition monitoring or related research and are major users of nutrition monitoring data. Agency membership includes USDA's ARS, CSRS, ERS, ES, FNS, FSIS, and HNIS; DHHS' ADAMHA, FDA, HRSA, IHS, NCCDPH, NCHS, and NIH; AID, Census Bureau, Bureau of Labor Statistics, Department of Defense, Department of Veterans Affairs, Environmental Protection Agency, National Marine Fisheries Service, and the Department of Education. The Board is responsible for enhancing the effectiveness and productivity of Federal nutrition monitoring efforts by improving the planning, coordination, and communication among agencies. Working groups under the auspices of the Board are addressing issues in survey comparability, Federal State information dissemination and exchange and food composition data bases. The Board is also serving as the major group in reviewing and providing technical guidance in development of the 10-Year Comprehensive Plan for Nutrition Monitoring and Related Research.

- o USDA-DHHS Joint Working Group for Development of 10-Year Comprehensive Plan for Nutrition Monitoring and Related Research

The National Nutrition Monitoring and Related Research Act of 1990 required the Federal Government to develop a 10-Year Comprehensive Plan for Nutrition Monitoring and Related Research. A Joint USDA-DHHS Working Group was established to assist in development of the draft plan which was published in

the Federal Register for public comment in the fall of 1991. Final publication of the Plan is scheduled for 1992.

- DHHS National Health Objectives for the Year 2000

HNIS is representing USDA on the Nutrition Objective Working Group of the DHHS National Health Objectives for the Year 2000 in order to promote uniformity between the Departments. National Health Objectives for the Year 2000 were issued by DHHS at the Healthy People 2000 Conference. As a member of the working group, HNIS is involved in supporting the Nutrition Objectives and ensuring that they are addressed in nutrition monitoring and dietary guidance programs.

- National Cholesterol Education Program

HNIS is USDA's liaison to the National Cholesterol Education Program (NCEP) Coordinating Committee. In this role, HNIS keeps the Committee informed of USDA research results from food consumption surveys regarding dietary status and activities that are supportive of the Dietary Guidelines for Americans.

B. Coordination Within USDA

- USDA Task Force on Nutrition Education

Better nutrition through nutrition education--with an emphasis on children and low-income adults--is one of USDA's four strategic goals. To lead this effort, a departmentwide task force has been established to unify, coordinate, and enhance USDA's nutrition education activities. The task force is co-chaired by the Assistant Secretary for Food and Consumer Services and the Assistant Secretary for Science and Education.

By the end of 1991, a working group had developed the coordination structure shown in the first 9 lines of table 8. Other elements of coordination are shown on the rest of table 8.

- CES/ES/HNIS Cooperation on Nutrition Education Information Needs

Through a Memorandum of Understanding initiated in 1987, ES and HNIS are working together to achieve their common goals in nutrition education. A Cooperative Extension System/ES/HNIS Consulting Group meets about three times a year through teleconferences and once a year in a face-to-face meeting to share information concerning Federal activities and priority nutrition education issues at State and local levels.

- HNIS and FNS Cooperation on Research Related to Federal Food Assistance Programs

HNIS and FNS cooperate in relation to research and data needs of each agency. HNIS staff meet regularly with staff from FNS to discuss the food plan revision process. HNIS staff also serve on an advisory group for an FNS project designed to identify the data needs for research on the nutritional effectiveness of food assistance programs.

Table 8. USDA Human Nutrition Research and Education Activities (Coordination within the Department)

Nutri. Ed. Init. Working Grp. (NEIWG)	AMS	ARS	OPA	CSRS	ERS	ES	NAL	FNS	FSIS	HNIS	OBPA	OCA	NASS	FGIS	APHIS	ASCS	FAS	OGC
Administrators																		
Nutri. Ed. Coord. Comm. (NECC)	COCHR	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Public Relations Comm.	X	X	X				X		CHR	X	X			X				
Long Range Plan (Futures)	X				X			COCHR	X	COCHR	X			X				
Research Activities	X	X			CHR	X	X			X	X	X	X	X	X	X	X	X
Education, Program Act.	X		X			X	CHR	X	X	X	X		X					
Evaluation		X			X	CHR	X			X	X		X	X				
Subcommittee Human Nutrition	X	CHR	X		X	X	X			X	X	X	X	X				
Dietary Guidance Working Grp. (DGWG)	X	X	X		X	X	X			X	X	CHR	X					
Federal Food Assistance Prog.	X									X	X							
Food Supply Data							X				X		X		X			
Food Safety Task Force		X	CHR		X	X	X			X	X		X	X	X	X	X	X
ESCOPE - Subcommittee on Human Nutrition		X			X							X						
CSRS Western Res. Proj. - Nutrient Bioavailability		X			X													
CSRS Western Res. Proj. - Diet, Fat & Fiber; Know., Perc. Risk & Diet Pract.			X											X				
CSRS N. Central Res. Proj. - Diet Recom. to Modify Lipid Metabolism			X		X									X				

USDA Human Nutrition Research and Education Activities (Coordination within the Department) -continued

	AMS	ARS	OPA	CSRS	ERS	ES	NAL	FNS	FSIS	HNIS	OBPA	OCA	NASS	FGIS	APHIS	ASCS	FAS	OGC
CSRS Northeast Res. Proj. - Nutri. Assessment of Older Adults		X		X								X						
CSRS N. Central Res. Proj. - Behav. & Hlth Factors Food Cons. Yng Adults					X							X						
<u>FSIS/ES Cooperative Effort</u>						X						X						
Nutrition Labeling Education					X	X	X	CHR	X	CHR	X	X						
Child Nutrition Labeling							CHR	X										
CES/HNIS/ES Coordinating Comm.								X				X						
1993 Yearbook		X	X	CHR	X	X	X	X		X	X	X	X			X		
USDA Pesticide Data Program Interagency Working Group							CHR	X			X	X	X	X				

- o HNIS and ERS Cooperation on Food Supply Data

HNIS and ERS cooperate in publishing information on U.S. food supplies. ERS produces the data on amounts of foods consumed, and HNIS uses those data to generate estimates of the nutrient content of the food supply.

- o Continuing Survey Users Group

Provides input to HNIS on the information needs of various Federal agencies in relation to the purpose and goals of the Continuing Survey of Food Intakes by Individuals.

- o Cooperative Regional Research Projects (CSRS)

The Cooperative State Research Service administers funding for cooperative human nutrition research involving land-grant institutions and the 1890 colleges and universities. These projects are regional and may involve ARS and HNIS scientists. The active regional projects in human nutrition are listed.

- o Western Regional Research Project (W-143)--Nutrient Bioavailability--A Key to Human Nutrition

Our understanding of the dietary factors that affect the digestion and absorption of available form of nutrients, especially vitamins and minerals, is limited. Since some of the nutrients (iron, pyridoxine, calcium, folacin) most affected appear to be marginal or low in the diets of certain population subgroups, data on bioavailability becomes of critical importance in establishing sound dietary requirements as well as in appraising dietary adequacy. This project involves 10 universities and the Western ARS Human Nutrition Research Center.

- o North Central Regional Research Project (NC-167)-- Health Maintenance Aspects of Dietary Recommendations Designated To Modify Lipid Metabolism

The objectives of this project are (1) to determine the effects of dietary omega-3/omega-6/omega-9 fatty acid ratios on physiological factors in humans and experimental animals; (2) to evaluate the effects of caloric intake, expenditure distribution, and dilution on serum lipid levels, metabolism, blood response, and body composition; and (3) to assess the effects of varying levels of dietary minerals on blood lipoproteins. This study involves collaboration among 10 universities and 2 ARS centers.

- o Northeast Regional Research Project (NE-172)--Nutritional Assessment of Older Adults: Diet Intake and Biochemical Studies

The objectives of this regional project are to (1) assess the validity of methods of determining food intake and study factors affecting food intake in older adults; (2) evaluate biochemical methods for measuring iron, magnesium, protein, and amino acid status of older adults; and (3) compare and integrate biological, cultural, and sociological measurements as indices of nutritional status in the elderly. This project involves researchers from nine States, ARS, and HNIS.

- o North Central Regional Research Project
(NC-200)--Behavioral and Health Factors That Influence
the Food Consumption of Young Adults

The objectives of this project are (1) to identify traits, behaviors, concerns, and perceptions that influence the food consumption decisions of young adults; and (2) to determine the influence of cultural, behavioral, and perceptual factors, and their interactions, on the diet of young adults. This project involves collaboration among scientists from eight universities plus HNIS.

- o Western Regional Research Project (W-182)--Dietary
Fat and Fiber: Knowledge, Perceived Risks and
Dietary Practices

Five objectives are addressed in this project:

- o to determine respondents' knowledge and understanding of the dietary guidelines for fat and fiber;
- o to determine the degree to which respondents are following the recommended guidelines;
- o to examine respondents' perception of health risks associated with intake of fat and dietary fiber;
- o to identify constraints to and motivating factors for following these guidelines in relation to population characteristics; and
- o to determine differences between respondents in the general population and those medically defined at risk with respect to knowledge and understanding of the dietary guidelines for fat and fiber, perception of associated health risks, and compliance with dietary recommendations.

Twelve universities plus HNIS are involved.

- o Southern Regional Research Project (S-216)--Changing
Patterns of Food Demand and Consumption Behavior

The objectives of this project are (1) to investigate and assess changing patterns of food demand and consumption behavior by way of parameter estimation of new and alternative theoretical and applied models, and (2) to develop and evaluate databases required to implement the first objective. This project involves about 30 universities, Agriculture Canada, Bureau of Labor Statistics, ERS, and HNIS.

C. Coordination With the Private Sector and International Organizations

Table 9 shows current active interaction between USDA, DHHS, the National Academy of Sciences, and various other groups from the private sector.

- o National Agricultural Research Committee (NARC)

HNIS participates in the functioning of this committee as a liaison member. NARC is one of four committees that identify and review research priorities for consideration by the Joint Council on Food and Agricultural Sciences,

Table 9. Human Nutrition Research and Education Activities (Coordination with the Private Sector)

	USDA	DHHS	NAS	Other
Nat'l Advisory Council - Mother, Infant, Fetal Nutrition	X	X		AAP, ACOG, NAWICD
<u>Federal Dietary Guidelines Advisory Committee</u>	HNIS	X		
Nat'l Healthy Mothers & Healthy Babies Coalition	ES, FNS	HRSA		Many
Comm. on Nutritional Status of Pregnancy & Lactation	HNIS	HRSA	X	
Committee on Pesticides in Children's Diets	No HNIS rep. at this time		X	EPA
<u>Child Nutrition Programs</u>				ASFSSA, NFMI
Nat'l Exchange Food Labeling Education	FSIS, OPA, NAL, BS, HNIS	FDA		Many
Breast Feeding Promotion Coalition	X	X		Many
<u>USDA Board HN Scientific Counselors</u>	X	FDA, PHS		14 people
Atwater Centennial	X			ILSI
Nat'l Nutrition Monitoring Committee	X	X		
<u>Nutrition Education Task Force</u>	HNIS, FSIS, ES	FDA, PHS		Many

which in turn identifies priorities for research and education for the Secretary of Agriculture.

D. Advisory Groups

1. Human Nutrition Board of Scientific Counselors (HNBSC)

Resolutions - During an executive session, the following resolutions were developed and adopted by the Board.

- o Resolution 1, Relating to the Need for Improved Facilities at Beltsville for Human Nutrition Research

Resolved that the Human Nutrition Board of Scientific Counselors, having previously visited the Beltsville Human Nutrition Research Center and evaluated its programs and facilities, hereby reaffirms its prior position that its facilities are inadequate for state-of-the-art nutrition with human subjects, and strongly urges the Secretary to include, in the FY 1993 budget, a request for planning funds for a new facility at Beltsville, in cooperation with the University of Maryland and other institutions engaged in human nutrition related-research in the area.

- o Resolution 2, Relating to Consumer Concerns About the Food Supply

Whereas consumers are frequently alarmed by reports of food safety issues which they are often ill-prepared to assess and whereas USDA has started initiatives to educate the public regarding food safety issues, it is hereby resolved that the USDA is encouraged to continue and enhance its efforts to:

- 1) Determine, on an ongoing basis, consumer concerns regarding risks related to the food supply.
- 2) Establish validity of consumer concerns regarding food safety.
- 3) Develop consumer education materials and programs designed to inform consumers about relative risks associated with the food supply, so that their concerns do not unnecessarily influence the selection of a healthful diet.

- o Resolution 3, Relating to Space Requirements of the Western Human Nutrition Research Center

Resolved that the Human Nutrition Board of Scientific Counselors express its concerns about the future space needs of the Western Human Nutrition Research Center (WHRNRC), presently housed in the Letterman Army Institute for Research (LAIR), Presidio, San Francisco, CA, and if WHRNRC is not permitted to remain in the LAIR facility, the Board strongly urges that appropriate actions be taken to locate the WHRNRC on an appropriate University of California campus.

- o Resolution 4, Relating to the Development of Nutrition Education Materials and Programs

Resolved that efforts will be directed to assess the effectiveness of materials and programs in meeting stated objectives in the defined target populations.

- o Resolution 5, Relating to Food Program Research Needs

Whereas the Department spends \$35 billion/year on important applied nutrition activities, including Cooperative Extension, School Feeding, WIC, and HNIS and

Whereas research is needed to support these activities, therefore be it resolved that the Department in collaboration with the Human Nutrition Board of Scientific Counselors carry out a workshop including subsequent written report to examine and report on the extent to which the needed research is carried out within or supported by the Department.

- o Resolution 6, Relating to Need for Scientific Personnel Training in Human Nutrition

Whereas the Human Nutrition Board of Scientific Counselors has been encouraged by the increased funding for the USDA Food and Agricultural Sciences National Needs Graduate Fellowships Program in FY 1991 and in suggestions for further increases in the President's FY 1992 budget, and

Whereas the continuing increase in awareness of consumers concerning the importance of nutrition in health and disease prevention has resulted in a corresponding increase in demand for adequately trained personnel, and

Whereas support for training to meet this demand has lagged behind need and has served as a deterrent to progress in correcting the shortfall,

The Human Nutrition Board of Scientific Counselors resolves renewed support of the USDA Food and Agricultural Sciences National Needs Graduate Fellowship Grants Program in the area of human nutrition and recommends continued efforts to expand the number of fellowships available.

- o Resolution 7, Relating to Nutrition Monitoring

The Board commends the current efforts and wishes to encourage the special attention being given by USDA to nutrition monitoring by evaluating current survey methodology and execution and by evaluating the operational structure of the Human Nutrition Information Service. Where appropriate, resources should be committed to: 1) improving the methodology and management of the survey and 2) to implementing a management structure that assures a continuing leadership role in nutrition monitoring.

- o Resolution 8, Relating to Nutrition Education in Medical Schools

Whereas the National Nutrition Monitoring and Related Research Act mandates that the Secretary of Health and Human Services consult with the Secretary of Agriculture to prepare a report that assures that U.S. medical students and practicing physicians have access to adequate training in nutrition and its relationship to human health,

Be it resolved that the Human Nutrition Board of Scientific Counselors recommends that the Secretaries include making the extensive nutrition education materials of the USDA available to medical school nutrition programs and, appropriately, to practicing physicians,

And recommends that the Secretary encourage the expansion of nutrition education programs in U.S. medical schools and the increased Federal support

of nutrition education of medical students and physicians in order to improve their contribution to the public good and the Nation's health.

The members of the Human Nutrition Board of Scientific Counselors offer their services in the development of the report and its followup.

- Resolution 9, Relating to Human Nutrition Components of the National Research Initiative (NRI)

Whereas, the NRI Human Nutrition and Food Safety Research Initiatives were ranked as high-priority research areas by the scientific community, and

Whereas, the human nutrition and food safety are inextricably linked to both plant and animal research, and

Whereas, the ultimate objective of the agricultural research system is to provide a healthy and safe food supply,

Be it resolved that the Human Nutrition Board of Scientific Counselors:

- strongly supports the NRI,
- is encouraged by the scheduled increases in funding and anticipates further increases in funding,
- strongly recommends that funding for the human nutrition and food safety research initiatives more closely reflect the priority recommendations.

- Resolution 10, Relating to Retiring Executive Secretary:

....BE IT RESOLVED that the USDA Human Nutrition Board of Scientific Counselors recognizes and appreciates the efforts of Gerald F. Combs, Sr., Ph.D., in assuring the efficient operation of this Board during the years since its inception.

....BE IT FURTHER RESOLVED that the Board recognizes and applauds the exceptional leadership and guidance Dr. Combs has provided ARS human nutrition programs during his tenure as Assistant Deputy Administrator for Human Nutrition.

- Recommendations by Advisory Bodies

A work group that included two members of the Board of Scientific Counselors and three nutrition professionals met with USDA agency representatives to explore creative ways to evaluate USDA's nutrition education materials/programs. The work group was convened in response to the Board of Scientific Counselors' resolution relating to the development of nutrition education materials and programs. Recommendations regarding nutrition education evaluation procedures used in the Department will be summarized in a report by the work group to the Board of Scientific Counselors by March 1992.

2. National Advisory Council on Maternal, Infant and Fetal Nutrition

The National Advisory Council on Maternal, Infant and Fetal Nutrition met on September 11-13, 1991, to deliberate on mandated reviews of the WIC food packages and nutritional risk criteria and to develop recommendations on these two vital program areas for a report to Congress. The report is due to be submitted to Congress in early Fiscal Year 1992.

In the Third Annual Report to Congress in February 1991, the National Advisory Council on Commodity Distribution recommended, among other things, that the Department:

- o Continue the thrust for a balanced, wholesome, and nutritious diet based on the basic four food groups and continue providing products to achieve this goal.
- o Seek ways to provide more nutrition education to all participants in USDA-supported food programs.
- o Review all instructions and information contained on product labels to ensure that the information is consistent with the Dietary Guidelines.

3. Pesticide Data Program

The pesticide residue monitoring program instituted by AMS is part of USDA's pesticide data program. It includes uniform sample collection, commodity analysis, and a quality assurance system. Current funding levels allow the program to involve six States, three commodities, and eight pesticide residues. EPA will use the data in setting pesticide tolerance levels, while other Federal and State agencies will use it in determining policies intended to safeguard the public health.

VI. BENEFITS

The USDA Human Nutrition Research and Education Program, described in its 1986 report to Congress, required the determination of nutrient needs and food sources of these nutrients, the monitoring of food consumption practices and the nutritional qualities of diets, and the development of information techniques to foster the selection of healthful diets by Americans. In pursuing this course, the program has embodied problem-oriented research coupled with research-based nutrition education of professionals, producers, and the public. Sound nutrition education efforts have led to changes in consumer demand, which, in turn, have provided industry with the opportunity to market modified and nutritionally improved food products.

Scientific investigations, such as those reported here, have clearly shown that what we eat can affect our health. In fact, most authorities agree that our diets can affect the risk of 5 of the 10 leading causes of death in the United States, including coronary heart disease, stroke, atherosclerosis, diabetes, and some types of cancer. Obesity is also due to an imbalance between energy intake and expenditure. In addition, several other problems, such as dental caries, bone strength, physical and mental performance, and immune response can be influenced by nutrition.

Benefits of improved diets and better nutrition are improved health and a longer, more active, and satisfying life. The development of new food and nutrition knowledge as well as the application of existing knowledge are essential to the alleviation of diet-related health problems. The USDA, through its many nutrition research and education activities, is developing information to fill in knowledge gaps and helping to apply the knowledge important to the alleviation of diet-related health problems and for better performance and well-being of Americans. During 1991 greater efforts than ever before were made to coordinate these nutrition-related activities in USDA.

New food and nutrition knowledge from USDA research benefits the public and the many segments of the population who produce and market food and who educate and provide health services to the public. Constantly new knowledge is required by policymakers who formulate food assistance, public health, and education programs. Nutrition knowledge forms the information base for dietary guidance for the public.

The USDA Food and Nutrition Program has contributed to up-to-date analytical data on the nutrient composition of foods in the forms that people use to meet their nutritional needs. When the long-range objectives have been achieved, even more reliable information will be readily available to determine the kind and amounts of nutrients in foods and diets. The technology is available to improve the nutritional value of many foods. Industry has also improved guidelines on changes in nutrient content of foods arising from processing, so that products might be improved where indicated. New regulations for nutrient labeling of food were introduced in 1991 to enable the public to better manage its food choices.

Advances in technology have made it possible to minimize nutritional inadequacies of most diets or diet patterns. The consumer benefits from knowledge of the nutritional usefulness of foods and can be assured of better nutrition where some foods have been improved. Health professionals, nutrition educators, food program directors, and the food service industry benefit from additional knowledge about nutrition. The USDA agencies involved in supplemental feeding have an improved scientific basis for food selection in their food distribution or food programs aimed at improving nutritional health.

For the consumer, better health may be enjoyed through improved nutrition resulting from diets providing the right amount and types of nutrients. People are better able to achieve their full genetic potential, including resistance to disease, intellectual development, and physiological well-being. These can be significant consequences of improved nutrition.

The potential economic benefits from improvement of human nutrition that results from research findings about food needs include significant reduction of health care costs for heart and vascular problems, reduced hospital costs in connection with respiratory and infectious diseases, reduced costs associated with arthritis, savings from less expenditures for dental services, savings for people with eyesight problems, and significant reduction of health costs for digestive problems and losses associated with alcoholism. Additional problems where improved nutrition can have tangible benefits include anemia, mental illness, infant mortality, aging, diabetes, osteoporosis, obesity, kidney and urinary problems, and certain cancers. There can also be increased economic benefits for different segments of the population, through increased work efficiency, an increase in the productive lifespan, and reduction in the number of days lost from work and school.

Considerable progress has been made, but many knowledge gaps remain. Undoubtedly, benefits can be expected to be derived from improved nutritional progress that will result during the next decade. Some of these may be because physicians are able to improve health care, food producers or processors are able to improve the nutritive value of food products, educators are able to guide families into improved dietary practices, or Government agencies are able to deliver better nutritional services in the administration of food programs for the needy or those at risk.

